National Spatial Development Strategy for Trinidad and Tobago

Surveying the Scene

CONTENTS

List of Figures

List of Tables

List of Acronyms

APDSL	All-Inclusive Project Development Services Limited
CEDP	Comprehensive Economic Development Plan
CSO	Central Statistical Office
EIA	Environmental Impact Assessment
EMA	Environmental Management Authority
GDP	Gross Domestic Product
GHG	Green House Gas
GIS	Geographic Information System
GORTT	Government of the Republic of Trinidad and Tobago
ICT	Information and Communications Technology
ISWRMP	Integrated Solid Waste Resource Management Policy
IWRMP	Integrated Water Resources Management Policy
LSA	Land Settlement Agency
MDPs	Municipal Development Plans
MEEA	Ministry of Energy and Energy Affairs
MPE	Ministry of Planning and the Economy
MTPF	Medium Term Policy Framework, 2011-2014
NHDI	National Human Development Index
NPDP	National Physical Development Plan
NSDS	National Spatial Development Strategy
SIDS	Small Island Developing States
T&TEC	Trinidad and Tobago Electricity Commission
UNFCCC	United Nations Framework Convention on Climate Change
WSD	Working for Sustainable Development

1. INTRODUCTION

This document is a distillation of the key elements of the evidence base used to support the preparation of the National Spatial Development Strategy (NSDS). It identifies key issues, and presents facts and information in five main parts:

- population and settlement;
- society and culture;
- the economy
- the environment; and,
- infrastructure.

In order to illustrate how the analysis has been applied to the NSDS Core Strategy and Regional Guidance document, a text-box follows each section and identifies the relevant objective(s) and policy/policies.

2. POPULATION AND SETTLEMENT DISTRIBUTION

Planning for efficient and effective use and management of Trinidad and Tobago's land and ocean space requires many demographic and related factors to be taken into account, including:

- population size and spatial distribution;
- demand for housing, employment and goods and services;
- people's daily commuting patterns;
- settlement patterns, that is, people moving from one place to another/places losing population and others gaining; and,
- impacts on the economy, the environment and the social structure of the country.
- squatting and its implications for sustainable development.

All these are actually the results of people's collective decisions and activities on a daily basis. Planning decisions need to be informed by an understanding of both the effects of those decisions and the reasons they are taken.

Trinidad and Tobago's 2011 population of 1,328,019[1] represents a 5.2% increase since the 2000 Census[2]. Whilst the population has continued to grow over the past 40 years, the rate of growth has been steadily declining since a peak in the 1970s-1980s, largely as a result of decline in the total fertility and birth rates. This is a normal pattern as a society develops. External migration particularly to North America has also been a significant factor during this period.
The forecast change to the population profile over the next decade is shown in Figure 1. It suggests that the population structure is in an advanced stage of demographic transition in which the number of children below the age of 15 years is decreasing while the number of persons over 60 years is increasing and the overall population size is trending toward a continuing decline in growth rate.
The CSO 2009 projections suggest that the total population may decline from 1,324,019 to 1,309,589 by 2020 and further decline to 1,294,347 by 2025 due mainly to decreased fertility and emigration. However alternative projections by the United Nations Population Division[3] suggest likely slow growth during that period with medium variant forecasts of 1,349,000 in 2020 and 1,333,000 in 2015. All projections indicate likely increases in the old age dependency ratio in future, pointing to the need for a clearly defined population policy for forward planning.

[1] Central Statistical Office, Ministry of Planning and Sustainable Development, 2012.
[2] The research for this document was undertaken prior to the official 2011 Census figures being released. It is recognised that the population figure has now been revised to 1,328,019, which represents a 5.2% increase (CSO, 2012).
[3] UN Population, Dept of Economic and Social Affairs of the UN Secretariat World Population Prospects, 2012

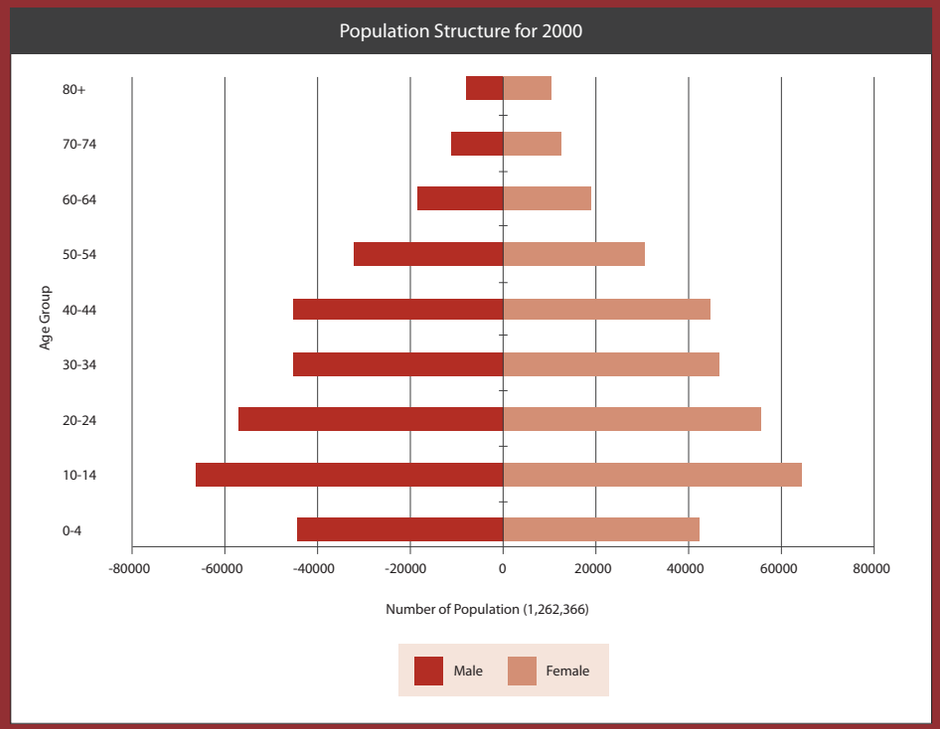
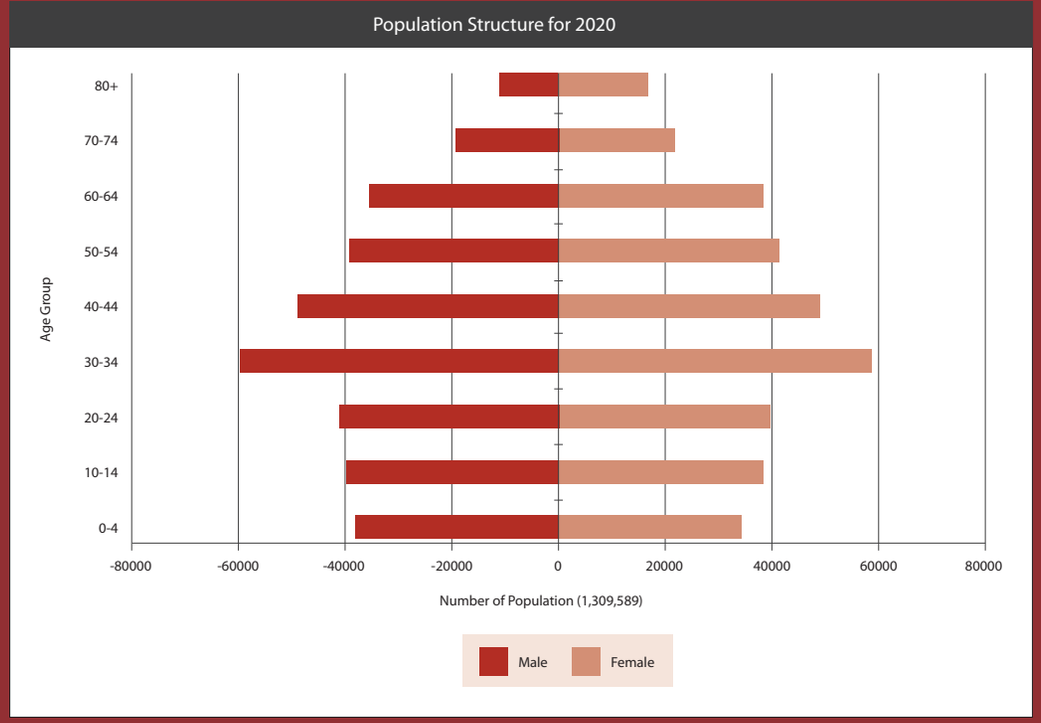
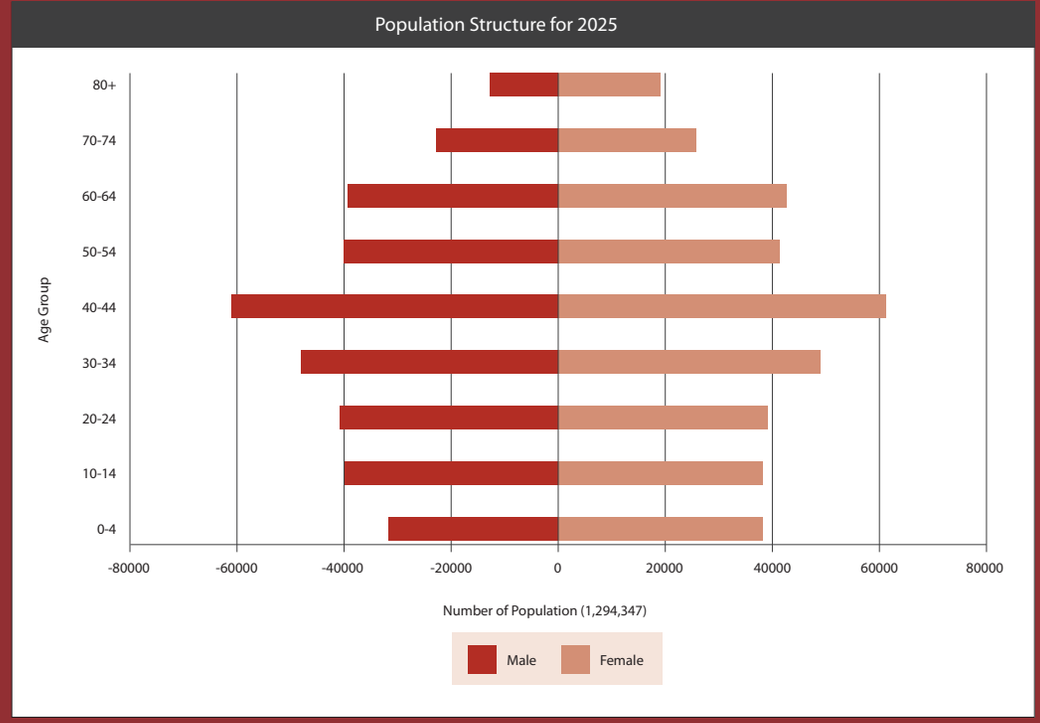


Figure 1: Population Structure for 2000 and Forecast Change in 2020 and 2025 (CSO Annual Statistical Digest, 2009)





Geographic Distribution

The existing settlement pattern shows marked concentration of urban settlements in the western half of Trinidad and the south-west of Tobago. In Trinidad, a large proportion of the island's population is concentrated in the highly urbanised regions of the East/West and North/South Corridors. By contrast, a much lower proportion of the national population lives in eastern Trinidad, the deep southwest peninsula, and the north-east of Tobago - all of which are relatively sparsely populated. In general terms, those predominantly rural regions have been experiencing lower levels of social and economic development with an associated poorer quality of life. The resulting regional imbalances are confirmed in the assessment of the National Human Development Index (NHDI) presented in the *Trinidad and Tobago Human Development Atlas 2012*[4] , which shows Sangre Grande and Mayaro/Rio Claro as having the lowest NHDI figures overall. Tobago had the lowest average annual household income per capita.

These general trends do, however, mask the fact that there are substantial pockets of poverty and deprivation in the main urban areas, and some wealthy communities in the rural areas. Deprivation, both urban and rural, is an issue that needs to be tackled through integrated planning and action.

The administrative divisions also have implications with respect to the implementation of projects and programmes at the regional and local levels. Development planning exercises, particularly at the national level, therefore must remain cognisant of the mechanisms, capacities and capabilities of these implementation agencies charged with development. Often times, the interventions required for effectively addressing particular issues cross administrative boundaries and require coordination between two or more implementing bodies. This becomes especially important at the Municipal Corporation level where activities of the local government bodies and state agencies must be aligned to avoid duplication of efforts and ensure improved service delivery.

Facts and Figures

- Population of Trinidad and Tobago: 1,328,019 in 2011 (1,262,366 in 2000)
- Trinidad: 1,267,145 in 2011 (1,208,282 in 2000)
- Tobago: 60,874 in 2011 (54,084 in 2000)

The populations of 4 of the 14 municipalities in Trinidad declined between 2000 and 2011:

- Port of Spain down by 24.3%;
- San Fernando down by 11.9%;
- Diego Martin down by 2.6%;
- San Juan/Laventille down by less than 1%.

In 2000, 30.5% of Trinidad's population lived in those four urban regions. By 2011 the proportion had decreased to 27% - a "loss" of just over 21,000 people from those core urban areas.
The regions of Trinidad in which populations increased most during the same period were:

- Chaguanas - population up by 16,083 (23.8%)
- Sangre Grande - population up by 11,423 (17.8%)
- Couva/Tabaquite/Talparo - population up by 15,631 (9.6%)

Taken together, those three regions have "gained" 43,137 people. The highest growth rate has been in Chaguanas and Couva/Tabaquite/Talparo which, together, have accounted for over half of the total increase in Trinidad's population between 2000 and 2011. Between 2000 and 2011 the proportion of Trinidad's people living in those regions increased from 19% to 26.6%.
None of Tobago's parishes lost population between 2000 and 2011 and during that period the island's population increased from 54,084 to 60,874 (up by 12.6%). The highest percentage rate of population growth (28%) was in St George, and the four western parishes – St Patrick, St Andrew, St George and St David – continuing to accommodate almost four fifths (80%) of the island's population.

[4] Central Statistical Office, Ministry of Planning and Sustainable Development, 2012

Population Density by Administrative Area, Trinidad and Tobago 2011

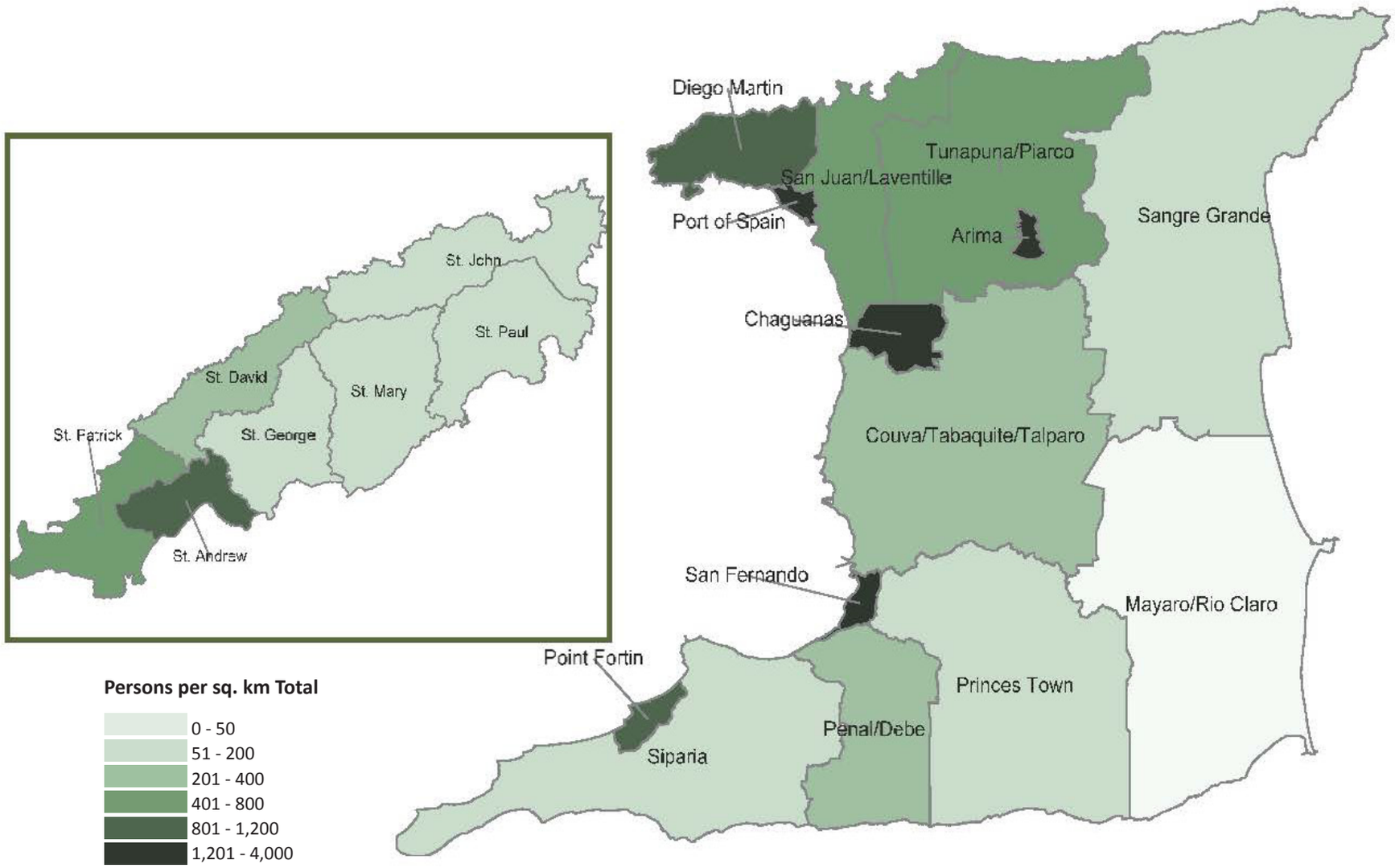


Figure 2:

Trinidad and Tobago 2011 Population and Housing Census
Demographic Report

Pattern and Form of Settlements

During the period since the National Physical Development Plan (NPDP) was prepared and approved, Trinidad and Tobago experienced rapid and extensive urban growth. Over that time, the population had grown by just under 19% (from about 1,079,800 in 1980 to about 1,328,019 in 2011)[5] but the area of urban land grew much more than this change on its own would have warranted over that same period.

Although a period of very high population growth followed the Second World War, growth has slowed markedly since 1990; the rate of urbanisation, however, has continued to increase. The result is that it is estimated that almost three-quarters (72%) of Trinidad and Tobago's people now live in urban areas[6].
The populations of the core areas of some of Trinidad's main cities and towns (Port of Spain, San Fernando, and Diego Martin) have been declining and, at the same time, there has been continuing migration from rural to urban areas. The growth has been mostly in between, in the form of increasingly sprawling suburban and ribbon (roadside) development.

Overall, the western regions of Trinidad account for 87.5% of the 2011 population (88% in 2000) with the eastern regions of Sangre Grande and Mayaro/Rio Claro accounting for 8.2% (7.7% in 2000) – so a marginal "redistribution" from west to east over that period, but still a very marked concentration of population in the west. Tobago's proportion of the national population remained the same at 4.3% [7]. The data for population density for the same period corresponds closely with that for population distribution.

Preliminary data from the 2011 Population and Housing Census shows no significant change in the broad pattern of development between 2000 and 2011. There is however some variation in the distribution of population growth over the period 2000 to 2011 as follows:

- an overall slowing of growth in the East/West corridor, with an absolute decline in the Port of Spain core metropolitan area but an overall increase in the Tunapuna-Arima area ;
- by contrast, the North/South corridor showed overall growth, with Chaguanas and Couva/Tabaquite/Talparo accounting for most of this;
- in San Fernando a pattern similar to that for the Capital Region with San Fernando City losing population whilst adjacent parts of its metropolitan area grew within the regions of Princes Town and Penal/Debe; and,
- the rest of the country experienced relatively low absolute growth.

---

[5] CSO, 2012
[6] Leontine Alkema, G. Jones, and C. Lai, Levels of urbanisation in the world's countries: alternative estimates. http://paa2012.princeton.edu/papers/121285.
[7] All-Inclusive Project Development Services Limited, The NPDP for Trinidad and Tobago, Phase 1: The Situational Analysis, Assessment Report

Population change between 2000 and 2011 by Administrative Area

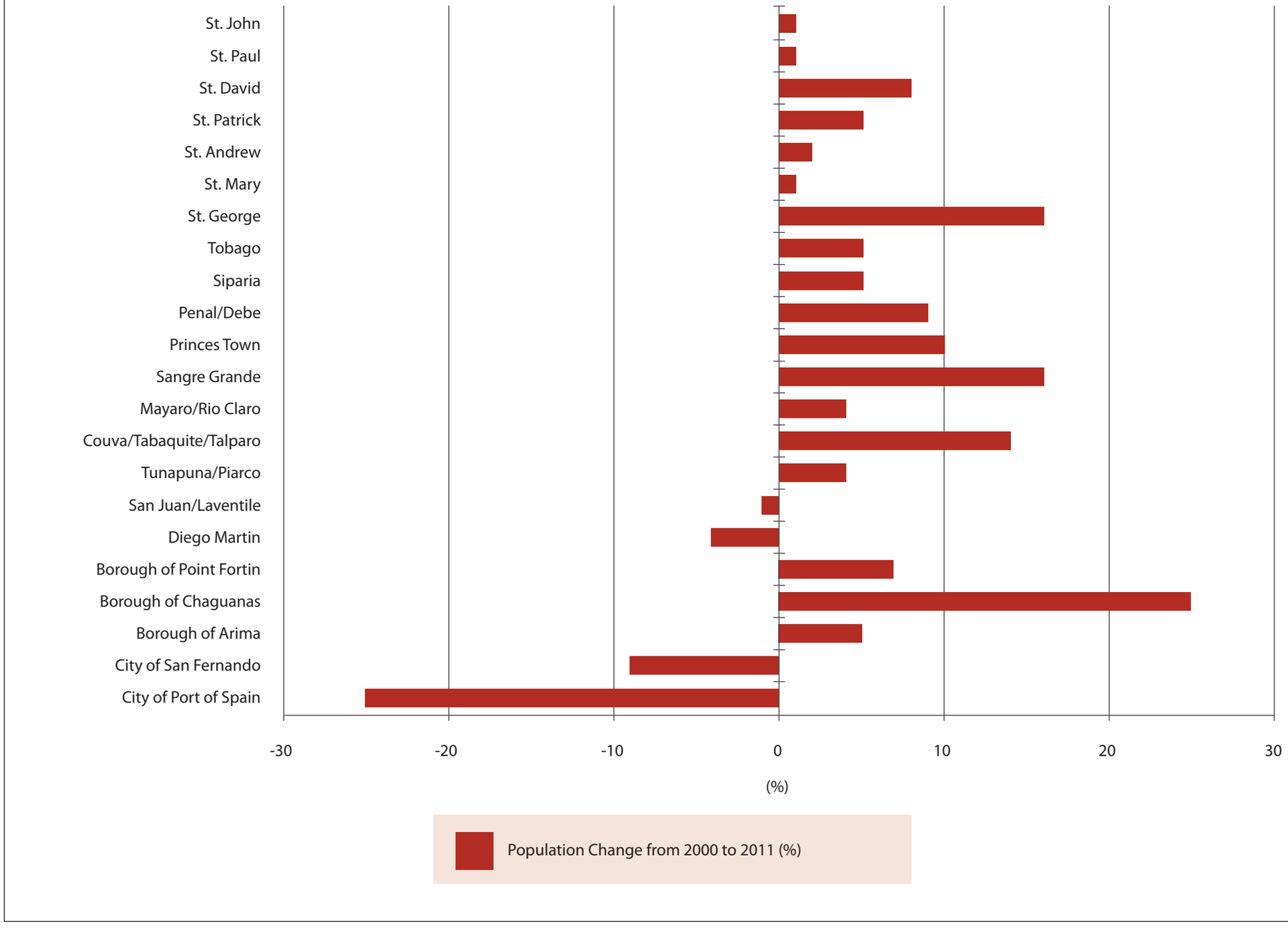


Figure 3: Population Change by Administrative Area 2000 - 2011
(Source: 2000 and 2011 Population Census Visitation Record, CSO)

Continuation of recent trends in the spatial distribution of population growth would be likely to result in the following:

- decline in the Port of Spain Metropolitan area with some growth taking place further east (Tunapuna – Piarco and Arima);
- decline in San Fernando proper, but growth in the adjacent areas comprising its metropolitan area;
- significant growth in Central, focused in and around Chaguanas; and,
- some growth in other regional towns and South-East Tobago.

NSDS response to Population and Settlement issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development Policy 3: Promoting sustainable urban and rural development

3. SOCIETY AND CULTURE

3.1 Crime

Notwithstanding the economic gains made over the last decade, escalating crime seriously threatens the country's prosperity agenda as it affects both individuals and whole communities. Indeed, crime and law and order are cited as one of the Government's five priority areas for action.
Figure 4 shows the spatial distribution of crime based on the police administrative districts of the country. Crime and anti-social behaviour are more concentrated in urban areas, but that is not to say that rural areas are unaffected.

The NSDS will not be able to influence the necessary improvements in law enforcement, the reform of the justice system or the rehabilitation of offenders, all of which are outlined in the Government's strategy for tackling crime containment and reduction. It can, however, shape the physical fabric and layout of urban areas, which have a bearing on the activities of offenders and victims and on opportunities for crime. Poor urban planning, design and management have increasingly been cited as playing a role in the shaping of urban environments that put citizens and property at risk. Effective urban planning, design and governance can therefore mould the built environment in ways that reduce the opportunity to commit crimes and anti-social behaviour.

Serious crimes (2010) in the Country by Police Division

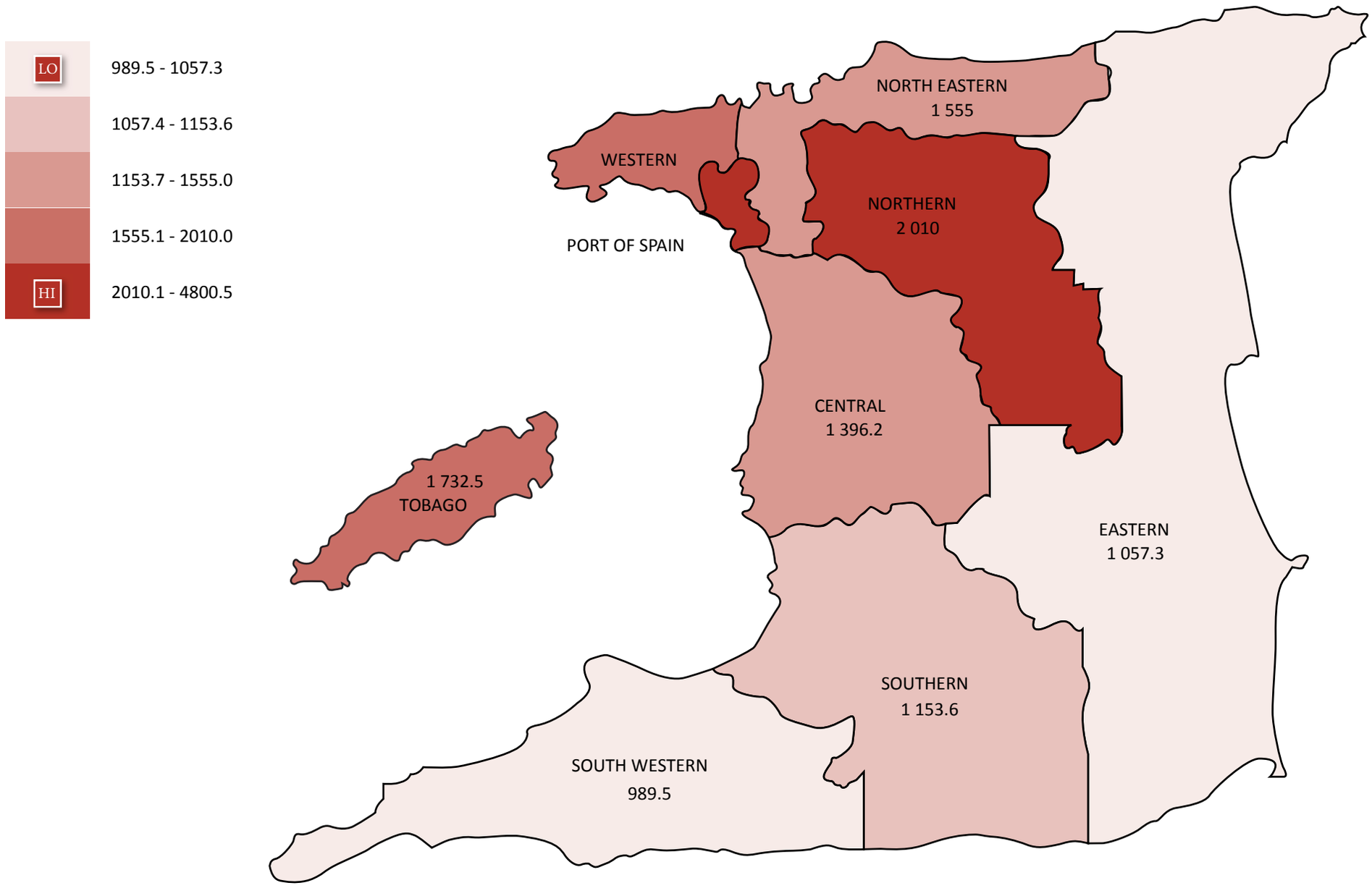


Figure 4: Distribution of Serious Crimes by Police Division (2010)
Source: Human Development Atlas, Central Statistical Office, 2012

NSDS response to Poverty-related issues

OBJECTIVE	POLICY
Building Places for People	Policy 4: Designing and creating places for people
Delivering the homes needed	Policy 5: Planning for healthy communities
Building a competitive, innovation-driven economy	Policy 7: Meeting housing needs
Making the most of Information and Communications Technologies	Policy 8: Planning to improve conditions for squatters
	Policy 9: Priorities for culture, sport and recreation
	Policy 11A: Leaving no one behind
	Policy 11B: Area-based economic priorities
	Policy 22: Priorities for ICT

3.2 Poverty

Poverty is a multidimensional issue caused by a level of deprivation of essential assets and opportunities. Based on income data, poverty levels increased by 2% between 2005 and 2008, but decreased by over 5% to 14.7% in 2011[8]. The current Government target is to reduce poverty by 2% per year.

Based on the results in the *Trinidad and Tobago Human Development Atlas 2012* and as illustrated in Figure 5, Sangre Grande and Princes Town had high Multidimensional Poverty Index (MPI) figures, indicating higher incidence and intensity of poverty. San Fernando and Tobago recorded the lowest values indicating the opposite.

Actions set out in the Government's *Medium Term Policy Framework* (MTPF), which are considered necessary for eradicating poverty, and have implications for spatial planning, are:

- restructure the economy to provide meaningful income-generating opportunities for sections of the population that have traditionally operated on the margins of the economy;
- increase access to adequate and affordable housing;
- empower the poor and target the most vulnerable groups in society for social support with direct impact on a family-by-family basis;
- strengthen social capital at the community level; and,
- build human capital through education, training and skills building.

The above actions require a series of coordinated policies and investments in order for the desired outcomes to be achieved. The role of the NSDS in this case is to facilitate the right spatial conditions, which enable necessary developments to come forward in appropriate locations.

[8] Ministry of Planning and the Economy, 2012. Working for Sustainable Development in Trinidad and Tobago.

Multidimensional Poverty (2006) by Administrative Areas

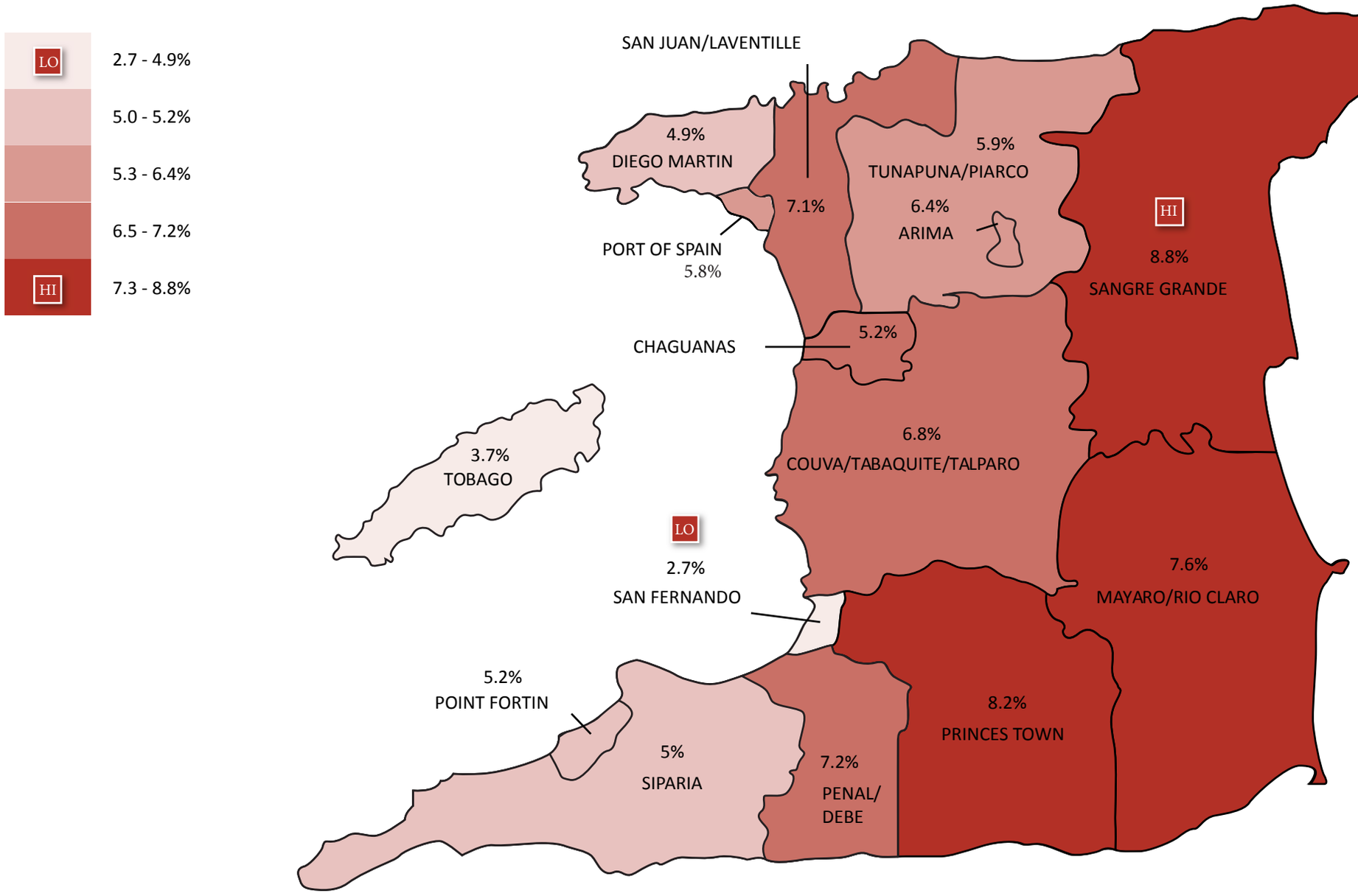


Figure 5: Multidimensional Poverty by Regional Corporation
Source: Human Development Atlas, Central Statistical Office 2012

NSDS response to Health-related issues

OBJECTIVE	POLICY
Building Places for People	Policy 5: Planning for healthy communities
Valuing cultural heritage	Policy 9: Priorities for culture, sport and recreation
Using natural resources sustainably	Policy 15: A coordinated approach to water resources and water quality
Moving towards sustainable transport	Policy 17: Air quality
Generating and using energy sustainably	Policy 21: Prioritising sustainable transport
Managing waste safely and efficiently	Policy 23: Energy efficiency
	Policy 24: Waste management

3.3 Health

Life expectancy in Trinidad and Tobago is increasing, which is a sign that health is improving. The most recent estimates put life expectancy for the overall population at 72 years[9]. There are significant gender differences however, with life expectancy for males lower than that for females at 69 and 75 years respectively[10].

A wide range of social, economic and environmental factors affect people's ability to attain a healthy lifestyle. There is growing evidence that planning can support healthy lifestyles and play a key role in reducing health inequalities. The NSDS must therefore introduce measures, which consider the following:

- improving air quality;
- safeguarding local food growing opportunities and improving access to healthy, affordable and locally-produced food;
- ensuring new development contributes to the creation of safe, accessible and inclusive communities and helps reduce crime and the fear of crime through good design;
- improving access to and diversifying employment, training and lifelong learning opportunities;
- improving access to health and social care facilities including upgraded and enhanced health centre and hospital plant; and,
- providing leisure, sports and recreation and community facilities that encourage physical activity.

[9] CSO, 2010.
[10] Ibid.

NSDS response to Housing issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Building Places for People	Policy 3: Promoting sustainable urban and rural development
Delivering the homes needed	Policy 4: Designing and creating places for people
	Policy 7: Meeting housing needs
	Policy 8: Planning to improve conditions for squatters

3.4 Housing

Housing of sufficient quantity, quality, affordability, and type is critical for successful communities and affects both urban and rural areas. Housing is a longstanding issue, with two particularly problematic aspects: there is an insufficient supply of adequate and suitable housing to meet current and future needs and, secondly, there is an issue of affordability, which is intrinsically linked to a supply-demand imbalance.

Recent housing projections have been based on the 2000 Census data. Previous housing assessments identified a need for 90,000 units over a 20-year period and represented both new and replacement demand. However, the demand has actually increased by more than was forecast, with the most current data suggesting that household size has reduced to 3.24, which is marginally lower than expected. An accurate housing assesment needs to be completed based on the 2011 Census data. Current estimates suggest over 100,000 units are required.

Delivering the right type of housing in the right location is critically important. The projected targets for new housing units have previously suggested that housing demand is concentrated in the nation's urban centres. Whilst the validity of this may be questioned given the declining population seen over recent years in some of these urban settlements, the issue must be considered in conjunction with the wider range of factors that the Strategy is addressing.

Access to affordable housing continues to be a challenge for large sectors of the population, as evidenced by the current estimate from the Land Settlement Agency (LSA) that some 300,000 people – or almost one-quarter of the total population – are currently squatting on 332[11] sites . Regularisation of some squatter settlements is a major component of housing provision and an essential aspect of the creation of strong and prosperous communities. Squatting has been the informal means by which some marginalised segments of the population have met their housing needs outside the formal housing market. However, this practice poses serious public health and environmental problems as well as inhibiting proper development in strategically located areas.

Fifteen sites have been regularised over the past decade and the LSA is advancing its work on site profiling for state lands, expecting to regularise a further 25 sites over the next six years. This will involve some relocation or resettlement. In conjunction with this programme, the Land for the Landless Policy established by the then Ministry of Housing and the Environment provides alternative land and support in order to prevent squatting. It is predicted to provide a total of 10,000 lots over a three-year period on a combination of greenfield sites, village expansions and infill of existing squatter sites.

[11] Ministry of Planning and the Economy, 2011. Medium Term Policy Framework 2011-2014.

3.5 Education

Investments in education over recent years have manifested in an improved rate of literacy[12]. The Government has confirmed its continued commitment to ensuring that every child has access to quality education by 2015 in the MTPF and through the Education for All Action Plan. Tertiary education also continues to receive support and the attainment target for 2015 is 60%.

It is widely recognised that a well-educated population is essential for pursuing strategic economic priorities, and if diversification is to be achieved then the education system must align with both current and future labour markets. These investments must also relate to high-value job creation in order to reduce the leakage that is occurring from "brain drain" emigration, which, at -7%[13], is one of the highest per capita levels of net migration in the Caribbean region.

In light of the above, the NSDS should provide an accommodating spatial framework for the development of education facilities and infrastructure and facilitate the right spatial conditions for generating a much-needed increase in high-value jobs for graduates of tertiary education programs.

NSDS response to Education issues

OBJECTIVE

Building Places for People

Building a competitive, innovation-driven economy

POLICY

Policy 5: Planning for healthy communities

Policy 11A: Leaving no one behind

Policy 11B: Area-based economic priorities

[12] Ministry of Education.
[13] CSO, 2012.

NSDS response to Cultural Heritage issues

OBJECTIVE	POLICY
Building Places for People	Policy 4: Designing and creating places for people
Valuing cultural heritage	Policy 9: Priorities for culture, sport and recreation
Building a competitive, innovation-driven economy	Policy 10: Planning positively for the historic environment
Using natural resources sustainably	Policy 11A: Leaving no one behind
	Policy 14: Landscape management

3.6 Cultural Heritage and Expression

Culture is an inclusive concept embracing a wide range of activities, places, shared beliefs, values and customs, which contribute to people's sense of identity, place and well-being. National priorities for culture are set out in the draft National Multiculturalism Policy Framework and draft National Cultural Policy, which were published for consultation in October 2012.

Different regions are associated with different cultural mixes, often reflected in particular events, festivals, cuisine and celebrations. These are an overwhelmingly positive and desirable contribution to the cultural variety of the country. That Carnival is such a central activity in life is a clear indication that the culture is both rich and deeply rooted in the national persona.

Cultural richness is further enhanced by the built environment, which has been created by the interaction of people with their surroundings over many centuries, and in some places contributes greatly to the cultural identity and sense of place experienced today. There are numerous features and buildings of historic interest, many of which express significant stages of the national and "pre-national" journey. Because they often originate from times when relatively inexpensive oil, gas and electricity were not widely available, and building materials had mostly to be found locally, the urban forms, architecture and construction techniques used in the past may themselves be a valuable heritage from which inspiration can be drawn for meeting some current and future sustainability challenges.

Fort George and Lopinot are managed as 'Historic Sites' as proposed under the 1980 Systems Plan but are not legally designated. Some 100 sites were inventoried for designation as heritage sites under the National Heritage Trust Act[14]. However, no designations have been made to date. The Banwari Trace Archaeological Site has been submitted for consideration as an UNESCO World Heritage Site along with the Pitch Lake at La Brea and the Main Ridge Forest Reserve in Tobago. Though some efforts have been made to preserve the Lion House in Chaguanas, much dismay has been expressed by concerned citizens about the failure to restore and maintain historic structures of architectural merit such as Stollmeyer's Castle and Mille Fleurs around the Queen's Park Savannah and other similar examples of past building heritage.

Cultural heritage also has significant economic value and, if preserved and marketed correctly, can greatly enhance the tourism offering whilst providing high quality environments for business and other economic activity. Cultural diversity and expression needs also to be allowed for in planning and development as the way people expect to use space (buildings and land) may differ between people of different cultural backgrounds.

[14] Chapter 40:53 was developed to protect any monument and any fossil, place or site of natural beauty or national, historic, scientific, or archaeological interest.

NSDS response to Recreational issues

OBJECTIVE	POLICY
Building Places for People	Policy 4: Designing and creating places for people
Valuing cultural heritage	Policy 9: Priorities for culture, sport and recreation
Using natural resources sustainably	Policy 13: Sustainable use of natural resources
	Policy 14: Landscape management
	Policy 16: Coastal and marine resource considerations

3.7 Recreation, Leisure and Sport

There are strong sporting traditions across both islands. This is recognised in the National Sport Policy of Trinidad and Tobago (2002) which has the overarching objective of fostering high performance sports as well as increasing overall participation in sport.

Whilst there are several major national sports venues, such as the Hasely Crawford Stadium in Mucurapo and the Queen's Park Oval in St Clair, local open spaces, sport and recreation facilities need to be accessible to communities as they contribute to health, well-being and quality of life of the population. Planning policies and decisions should, therefore, aim to promote, achieve and deliver good quality public space, shared recreational space and sports venues that the community needs.

The natural environment is also a valuable resource for providing opportunities for informal recreation and parks and forests provide both formal and informal recreation opportunities to residents. The creation of new facilities may be desirable in some locations. Both islands have a network of accessible hiking trails and Tobago is beginning to cater for the increasing popularity of mountain biking and other adventure-type outdoor activities. There is scope for further routes to be developed and further diversification of the economy may provide new opportunities for sporting and leisure activities.

4. ECONOMY

4.1 Agriculture and Fisheries

Agriculture

It is estimated that approximately 20% of land in Trinidad is under agriculture, but the output from this sector contributes less than 1% of GDP[15]. This has resulted in substantial increases in food imports over recent years. The revitalisation and modernisation of the agriculture sector therefore continues to be a Government priority.

The five mandates set out in the National Food Production Action Plan (2012) (NFPAP), are as follows:

- reduce the food import bill;
- further reduce inflation, primarily driven by food prices;
- create sustainable, long-term productive employment;
- contribute to the diversification of the economy; and
- increase the country's food security.

The means of achieving these mandates includes increasing the areas under cultivation. This entails two key initiatives: the Large Commercial Farms Programme and the Caroni Green Initiative. Areas currently cultivated and the projections for the next two to three years are set out below.

Table 1 – Area under cultivation in Region by hectares and acreage

Areas currently cultivated	Area (ha.)	Area (ac.)
Regional Administration South		
- Victoria	1,871.90	4,625.57
- St Patrick West	1,513.53	3,740.01
- Nariva/Mayaro	1,308.00	3,232.14
- St Patrick East	425.97	1,052.59
Sub-Total	5,119.40	12,650.31
Regional Administration North		
- St George East	651	1,608.66
- St George West	1,620	4,003.11
- Caroni	1,650	4,077.24
- St Andrew/St David	5,783	14,290.10
Sub-Total	9,704	23,979.11
Total	**14,823.40**	**36,629.42**
Projects (2-3 years)		
• Large Commercial Farms[16]	1,708.99	4,223
• Caroni Green Initiative[17]	2,347.18	5,800
Sub-Total	4,056.17	10,023
Grand Total	**18,879.57**	**46,652.42**

Source: Ministry of Food Production 2013

[15] MTPF, 2011

Agriculture

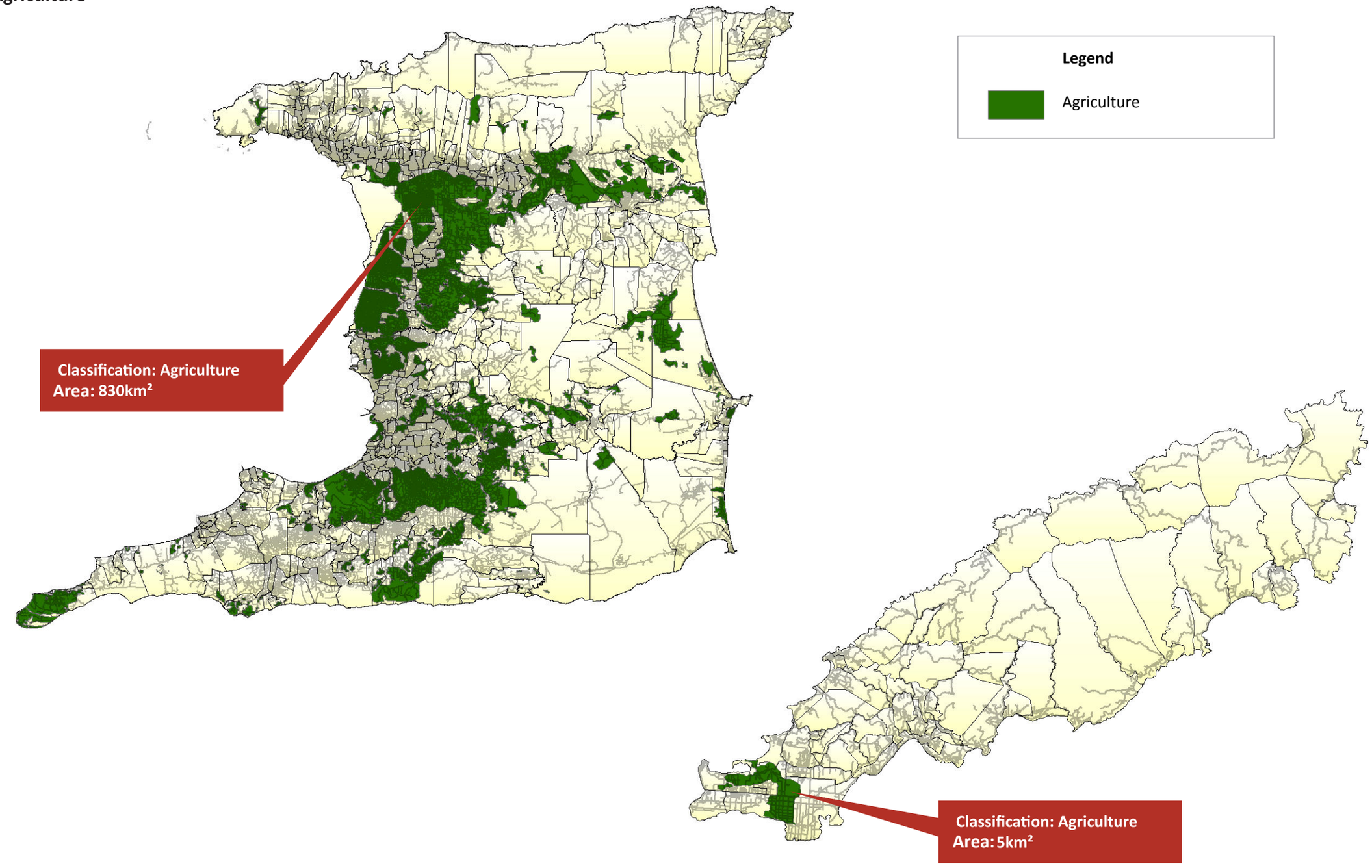


Figure 6: Agricultural Land in Trinidad and Tobago (2010)

There are, however, several key challenges that affect cost, quality and level of production within the sector. These include:

- poor agricultural practices and low levels of technology;
- inadequate infrastructure – poor access roads, water resource management and drainage systems;
- delays in farmer regularisation on state lands;
- limited quantity and quality of land designated for agricultural purposes; and,
- low priority assigned to the fisheries industry.

Only a small percentage of agricultural land falls within land capability classes I and II[16]. This land is the most fertile and is mainly located in the valleys and foothills of the Northern Range but much has been lost to urban development. A further 70% of the total national land area comprises soils in land capability classes III to V, which are generally suitable for tree crops and pasture[17]. Much of this was formerly under sugar cane cultivation, as well as cocoa and coffee estates in eastern Trinidad. Currently however, a large proportion is fallow and underutilised or subject to proposals for built development including distribution of the former Caroni lands for housing. Currently, classification of land capability is based on what some experts consider to be out-dated criteria. The probable consequence of this is undervaluation of the capability and agricultural potential of some lands and overvaluation of others.

Conflicts and competition for land between agriculture and other uses have generally resulted in the permanent loss of agricultural land. Agricultural activities are therefore increasingly pushed to unsuitable and unsustainable locations, such as hilly and forested areas. If food security is to be achieved in the near future this trend must not continue. There is a pressing need to look again at land classification in some detail so that land of strategic agricultural value is not lost to non-agricultural development. This should be undertaken region-by-region, with the outcomes then being reflected in the review of the existing Municipal Development Plans (MDPs) and in the more detailed local area plans to be prepared.

There are significant environmental impacts of agricultural practices such as the pollution of water sources caused by the use of herbicides and pesticides. The increasing practice of largely unregulated and unauthorised small scale and subsistence farming on the slopes of the Northern Range in Trinidad is also resulting in the loss of forest cover through unsustainable agricultural practices such as slash and burn land clearing by farmers. This has led to a general increase in soil erosion, uncontrolled storm water runoff and downstream flooding and siltation of watercourses. The effects on both Port of Spain and the densely populated north-western areas have been an increase in the frequency, severity and number of areas impacted by flooding events resulting in costly property damage.

Similar farming practices are of concern in Tobago where competition for limited land resources, particularly associated with the tourism sector, has already placed considerable strain on fragile ecosystems such as the Buccoo Reef/Bon Accord Lagoon Complex. The significant decline in agricultural production in Tobago is noteworthy and recognised as one of the crucial areas to be addressed in the CEDP.

[16] APDSL, 2012.
[17] Ibid.

NSDS response to Agriculture and Fisheries issues

OBJECTIVE	POLICY
Building a competitive, innovation-driven economy	Policy 11A: Leaving no one behind
Achieving food security	Policy 11B: Area based economic priorities
	Policy 12: Planning for agriculture and fisheries

Fisheries

The marine fisheries of Trinidad and Tobago are characterised by a high diversity of species harvested by many gear types and fishing fleets, including commercial and recreational components. Due to its location on the Guianas-Brazil continental shelf, the marine resources off Trinidad are diverse. Off Tobago, the prevailing oceanic conditions are favourable to pelagic species, and to a lesser extent, reef species. Some fish stocks are migratory and common with northern South American countries as well as the Caribbean islands chain.

Marine fisheries have traditionally been accorded low priority in previous development plans for the agricultural sector and there is currently no national policy covering the industry. The sub-sector is characterised by out-dated legislation; inadequacy of marketing systems; inability to enforce provisions with respect to over exploitation; poor conditions and lack of facilities at landing sites and beaches; and lack of production data and market intelligence.
With the fluctuations in the prices of fish, exacerbated in recent years at peak periods of demand, there are however considerable prospects for fish processing businesses in the areas of drying, salting, smoking, fresh freezing and even canning at the cottage level based on available small scale technology.
Opportunities also exist in aquaculture or fish farming, in particular tilapia, for the export market.

NSDS response to Quarrying and Mining industry issues

OBJECTIVE	POLICY
Using natural resources sustainably	Policy 13: Sustainable use of natural resources
	Policy 14: Landscape management
	Policy 17: Air quality
	Policy 18: Sustainable mineral use

4.2 Quarrying and Mining

Quarries provide valuable sources of aggregate materials for the construction industry. The heightened demand for building materials between 2006 and 2007 increased the search for aggregates. There are currently 69 legally active quarries, 31 of which extract sand and gravel. Asphalt is also mined at the Pitch Lake in La Brea, which is the world's largest natural deposit of asphalt. In Tobago, the primary material quarried is andesitic aggregates and rotten rock used primarily as a supplemental road building material.

The rising demand for these minerals has also led to proliferation of illegal quarry sites, which have not been granted Certificates of Environmental Clearance by the Environmental Management Authority (EMA). Given the considerable environmental impacts of these activities, such as noise pollution, air pollution, land degradation, river sedimentation and loss of wildlife habitats, all applications for a Certificate of Environmental Clearance for quarries of all sizes now require an Environmental Impact Assessment (EIA). Quarries granted licenses before the change to the regulations are allowed to operate until the license expires.

The MEEA is currently undertaking a Strategic EIA to establish mining zones and reduce the environmental impacts in each location by recommending appropriate remediation strategies. The information and analysis that result from this project will need to be incorporated into spatial development plans. Such plans must take into account that quarrying materials are a necessary ingredient of building construction for development, and a strategic balance must be struck between exploitation and environmental concerns.

NSDS response to Oil and Gas industry issues	
OBJECTIVE	**POLICY**
Building a competitive, innovation-driven economy Using our natural resources sustainably	Policy 11A: Leaving no one behind Policy 11B: Area-based economic priorities Policy 13: Sustainable use of natural resources Policy 14: Landscape management Policy 19: Sustainable energy extraction

4.3 Oil and Gas

Oil and natural gas have supported economic growth for the past 50 years and have consistently sustained economic and infrastructure development. In 2011, the petroleum sector accounted for 40% of GDP, but only 3% of employment.

Heavy reliance on the oil and gas sector continues to have a direct impact on the carbon footprint of the country. Trinidad and Tobago makes a disproportionate contribution to "green-house" gas (GHG) emissions, ranking 71st in the world in terms of the total national output of carbon emissions, and placed in the top 5 for carbon output per person . This results in negative impacts on the natural resources (land, waterways, and atmosphere) as well as on human health.

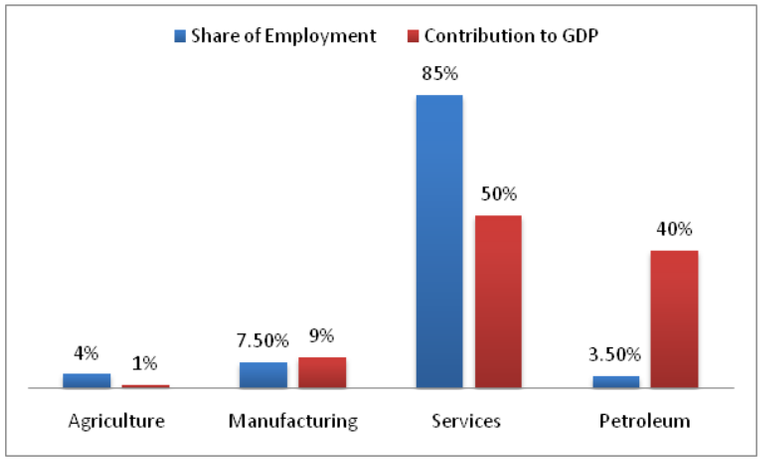


Figure 7: Employment share and GDP contribution of economic sectors between 2010 and 2011 (Source: Ministry of Planning and the Economy, 2012).

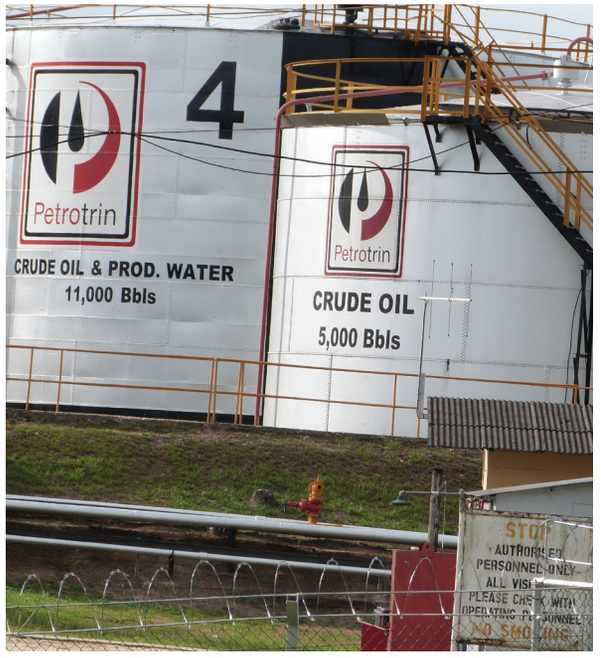
While there have been recent oil and gas finds - and it is possible that additional discoveries will be made - the challenge of over-dependence remains. Although oil and gas deposits are extracted both at sea and on land, the processing facilities and energy-related industries (including ammonia and methanol) are concentrated in the coastal zone, particularly along the west and south-west coastline of Trinidad, because of the availability of flat land and proximity to port facilities. Most of these are located in the major industrial estates, along the coastline, within urbanised areas and in areas that drain into coastal waters. The NSDS should ensure that consideration is given to the way in which additional on-shore wells are developed and treated under the purview of the Ministry of Energy and Energy Affairs (MEEA) and the locational implications of new oil and gas based energy enterprises.

4.4 Manufacturing

Currently, employment within the manufacturing sector averages approximately 7% of the total employed population. The Government has confirmed that it will look to diversify this sector, with emphasis placed on specialised skills training and development to encourage competitiveness and sustainability in green manufacturing. The benefits of cluster development are also recognised and the Couva Chaguanas Carapichaima Charlieville (4Cs) Growth Pole, Tamana InTech Park and the Cove Eco-Industrial and Business Park are identified as providing high-value manufacturers with a competitive advantage in high-quality infrastructure and business-to-business opportunities.

Most manufacturing, service, construction and energy-related industries are located in the major industrial estates. Some industries are also located on the coast because of ease of access to seawater for cooling and proximity to power generation plants.

The number of estates located in catchment areas that drain into the Gulf of Paria has given rise to a series of environmental concerns because the coastal zone and the assets therein are extremely vulnerable and susceptible to contamination and damage from effluents and solid waste discharges from industry. The task of integrating these significant industrial projects into a broader framework for coastal zone planning is clearly important.



NSDS response to Manufacturing industry issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Building a competitive, innovation-driven economy	Policy 3: Promoting sustainable urban and rural development
Using natural resources sustainably	Policy 11A: Leaving no one behind
	Policy 11B: Area-based economic priorities
	Policy 16: Coastal and marine resource considerations

4.5 Service Industries

Retail, trade and distribution represent the most significant activities within the service sector. By 2010 the sector represented an estimated 45.9% share of GDP and some 84.1% of employment.

The country's retail, trade and distribution units have largely been established in or close to settlement centres. However, a notable trend over the last 40 years has been the development of suburban and 'out-of-town' shopping malls. The spatial impact of mall construction has been to attract customers away from the older commercial urban centres by providing easier access, parking, and security.

The commercial activities along the East/West Corridor form a near constant string of ribbon development. Urban commerce and distribution industries are particularly prevalent in the Borough of Chaguanas where a high level of self-sufficiency is being approached. Unfortunately, this has been accompanied by severe traffic congestion and restricted accessibility to the town centre and between the eastern and western side of the Solomon Hochoy Highway.

Public administration and public services form part of the service sector and are essential for meeting the needs of the population. The services themselves are people-oriented and the sector is a major provider of jobs. The location and distribution of government offices and other activities must be considered in the organisation of the spatial pattern. In most cases the higher-order services are located in the national and regional centres, and the lower-order services in local centres and neighbourhoods. Given that spatial location can positively influence the efficiency and effectiveness of service delivery, decisions on public sector services and facilities should be subject to a structured spatial decision-making process, especially in terms of facilitating the implementation of development strategies and configuration into well-planned clusters for cost effectiveness and economies of scale.

NSDS response to Service industry issues

OBJECTIVE

Building strong, diverse regions

Building a competitive, innovation-driven economy

POLICY

Policy 2: Sustainable regional development

Policy 3: Promoting sustainable urban and rural development

Policy 11A:Leaving no one behind

Policy 11B: Area-based economic priorities

4.6 Tourism

Tobago has traditionally been the focus for the country's 'sun, sea and sand' tourism product, which has long been the main tradable sector for the island. However, the increase in oil prices in 2007/08 (and consequently the cost of travel) followed by the global economic crisis saw international tourist arrivals to Tobago fall significantly over the period 2006-2010.

Given the strategic location and geographical landscape, along with the rich and diverse cultural traditions, both islands have significant potential to develop a wider range of tourism products and services, including:

- Eco-tourism;
- Community tourism;
- Heritage, cultural and events tourism;
- Sport, leisure and health tourism;
- Industrial tourism; and,
- Conference tourism.

The National Tourism Policy is predicated upon the overarching national policy framework for sustainable development and is aligned to the seven interconnected pillars set out in the MTPF. The Government recognises that building a viable tourism sector requires strong public/private sector partnerships, inclusion and support of the national community, emphasis on our cultural diversity and strategic application of modern information communication technology platforms to ensure efficiency and cost-effectiveness.

Given the potential of the tourism sector to create employment, alleviate poverty, earn foreign exchange and stimulate the creation of inter-industry linkages, particularly with agriculture, construction, manufacturing, sports and other service industries, the Government is committed to the development of a responsible, sustainable and competitive tourism industry as a means of delivering positive social and economic transformation.

In land use terms, the National Tourism Policy recognises the need for effective allocation and use of land resources and undertakes to develop a plan of suitable and available sites for hotel development and state-of-the art sporting facilities as well as the creation of new zones in areas such as Chaguaramas and others to be designated National Parks, sites and attractions.

Many of these demands are likely to be satisfied within coastal environments. Tourism-related infrastructure, especially cruise ship terminals, small vessel landings and marine recreation facilities are also concentrated in this zone. In some areas, conflicting and mutually incompatible land uses exist and the NSDS must provide the necessary framework for the consideration of these issues by Municipal Corporations and the Tobago House of Assembly. Examples of issues include:

- the tar and oily deposits associated with off-shore oil mining that have damaged beach resorts along the Mayaro coast;
- the combination of high-speed boating activity, sailing, fishing, sea-bathing and some industrial activity on the Chaguaramas Peninsula and offshore is lands which pose a potential risk to human safety; and,
- in Tobago, there is evidence of conflicts at Pigeon Point, Plymouth, and Store Bay where fishing, hotel, and marina activities take place in close proximity to one another, pose a risk to human safety and threaten the lagoon and reefs which have already been damaged, especially Buccoo Reef/Bon Accord Lagoon[18]. The coral reefs in Tobago are critical in providing shoreline protection estimated to be worth between US$18m and US$33m[19].

[18] Coral reef formations occupy about 70% of coastal waters, but there has been significant loss of coral due to bleaching, pollution and sedimentation, human damage and storm/wave activity.
[19] Lauretta Burke, Suzie Greenhalgh and others, Coastal Capital: Tobago The Economic Contribution of Tobago's Coral Reef. World Resources Institute, 2008.

NSDS response to Tourism industry issues

OBJECTIVE	POLICY
Valuing cultural heritage	Policy 8: Priorities for culture, sport and recreation
Building a competitive, innovation-driven economy	Policy 9: Planning positively for the historic environment
Using natural resources sustainably	Policy 10A: Leaving no one behind
	Policy 10B: Area-based economic priorities
	Policy 12: Sustainable use of natural resources
	Policy 13: Landscape management
	Policy 15: Coastal and marine resource considerations

5. ENVIRONMENT

5.1 Ecosystems and the Services they provide

Given its relatively small total land mass, Trinidad (4,829km^2) and Tobago (300km^2) has a remarkably rich and varied natural environment, due to its tropical geographic location as well as its location on the continental shelf of South America. Prominent landscape features include:

- the Northern, Central and Southern Ranges of Trinidad, and the Main Ridge in Tobago, the Caroni and Naparima Plains and the Aripo Savannah. There are extensive areas of forest, much of which have a degree of protection as Forest Reserve. Tobago's Main Ridge Forest Reserve has recently been nominated for designation as a World Heritage Site;
- the largest wetlands – the Caroni Swamp and the Nariva Swamp – together with the renowned Buccoo Reef/Bon Accord Lagoon are all internationally protected wetlands (under the RAMSAR convention); and,
- the main rivers, including the Caroni, Nariva, Caparo, Ortoire and North Oropouche Rivers in Trinidad, and the Courland and Hillsborough Rivers in Tobago.

Many of the above features are legally designated protected areas and the National Protected Areas Policy (2011) establishes a framework for their selection, legal designation and management. According to the policy, a protected area is defined as "a geographically defined area of land, body of freshwater or sea, or combinations of these, which is designated and managed through legal or other effective means to:

- conserve biological diversity thereby maintaining genetic, species and ecosystem diversity, evolutionary and ecosystem patterns and processes;
- maintain ecosystem goods and services and facilitate sustainable use; and,
- provide recreational, educational, cultural and spiritual/religious opportunities and facilitate the development of sustainable livelihoods.

The protected area categories that have legal status are:

- Forest Reserves;
- Wildlife or Game Sanctuaries;
- Protected Marine Area;
- The North-West Peninsula of Trinidad;
- Prohibited Areas;
- Environmentally Sensitive Areas; and,
- The upper Courland River Basin in Tobago (above the intake) and the Quare River valley in Valencia (between the Hollis Dam and the intake). These areas are protected only in so far as potentially polluting activities are prohibited within the designated area.

Other categories of protected areas include:

- Un-proclaimed Forest Reserves;
- Natural Landmark;
- Historic Sites;
- Cleaver Woods which is managed by the Forestry Division as a Recreation Park, one of the proposed areas under the 1980 Systems Plan, but both the site and the category have not been legally designated; and,
- National Heritage Parks which were proposed and are being partially implemented by the Local Government, including the Devils' Woodyard. However, there is no legal status for such parks.

The rich and diverse natural environment provides a wide range of 'ecosystem services': resources and processes that support and enhance overall quality of life. These can be grouped under four headings:

- Provisioning Services;
- Regulating Services;
- Cultural Services; and,
- Supporting Services – as illustrated in the diagram below.

The environment and the ecosystems it supports are constantly threatened by the pressures of human activities such as building, quarrying, road construction, waste disposal, farming, and pollution from traffic, industry and other activities. Efforts to coordinate and improve environmental management both institutionally and legislatively have led to some significant progress over recent years. However, a wide range of environmental problems continue to persist in various parts of the country as a result of inappropriate use of land and lack of enforcement.

Land use controls established in the National Physical Development Plan sought to protect agricultural land and conservation areas. However, there are certain areas of both Trinidad and Tobago where the land use apportionment has been severely altered following un-regularised urbanisation. The results are most conspicuous in Trinidad's Northern Range where forest has been lost to quarrying, housing (including squatting) and farming.

Trinidad's Mangroves, Swamps, Protected Parks, Forest Reserves and Wildlife Sanctuaries

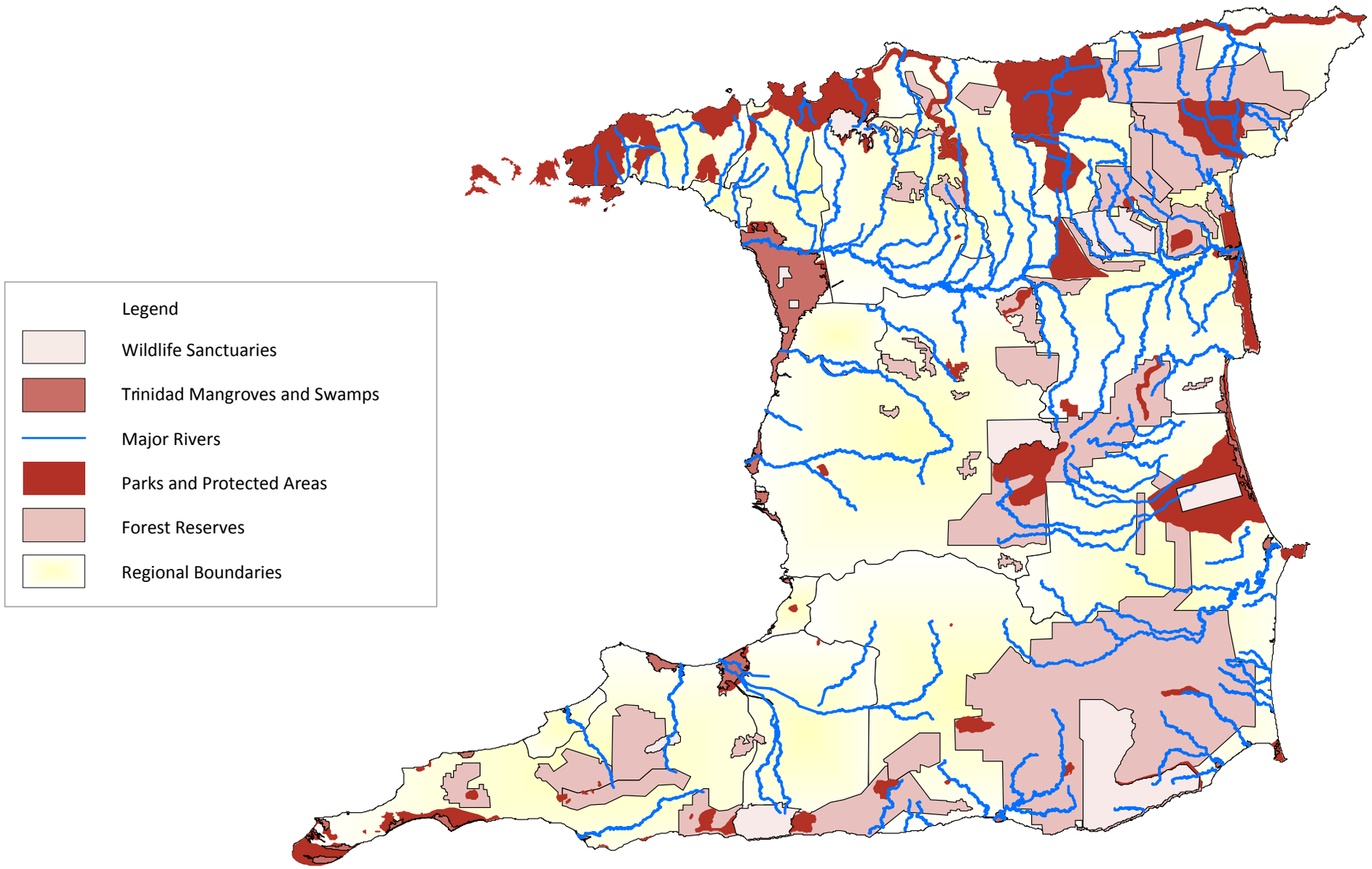


Figure 8: Protected areas in Trinidad

The rich and diverse natural environment provides a wide range of "ecosystem services": resources and processes that support and enhance our lives and activities, some of which are, ultimately, crucial to human well-being. These can be grouped under four headings: Provisioning Services; Regulating Services; Cultural Services; and, Supporting Services – as illustrated in the diagram below.

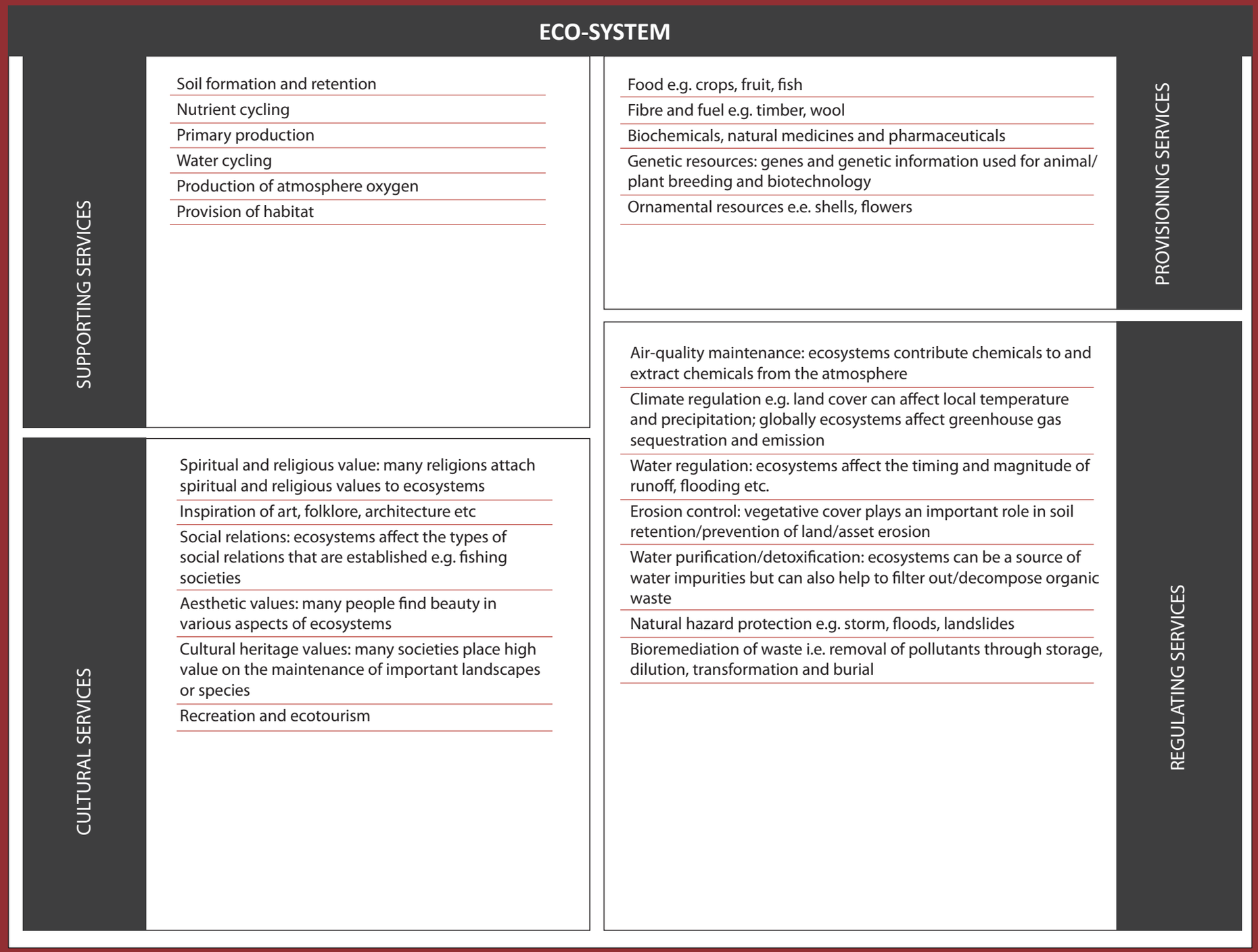


Figure 9: Ecosystem Services Diagram (derived from "Millennium Ecosystem Assessment" United Nations 2001)

Change in Land Coverage in Trinidad and Tobago between 1991 and 2010

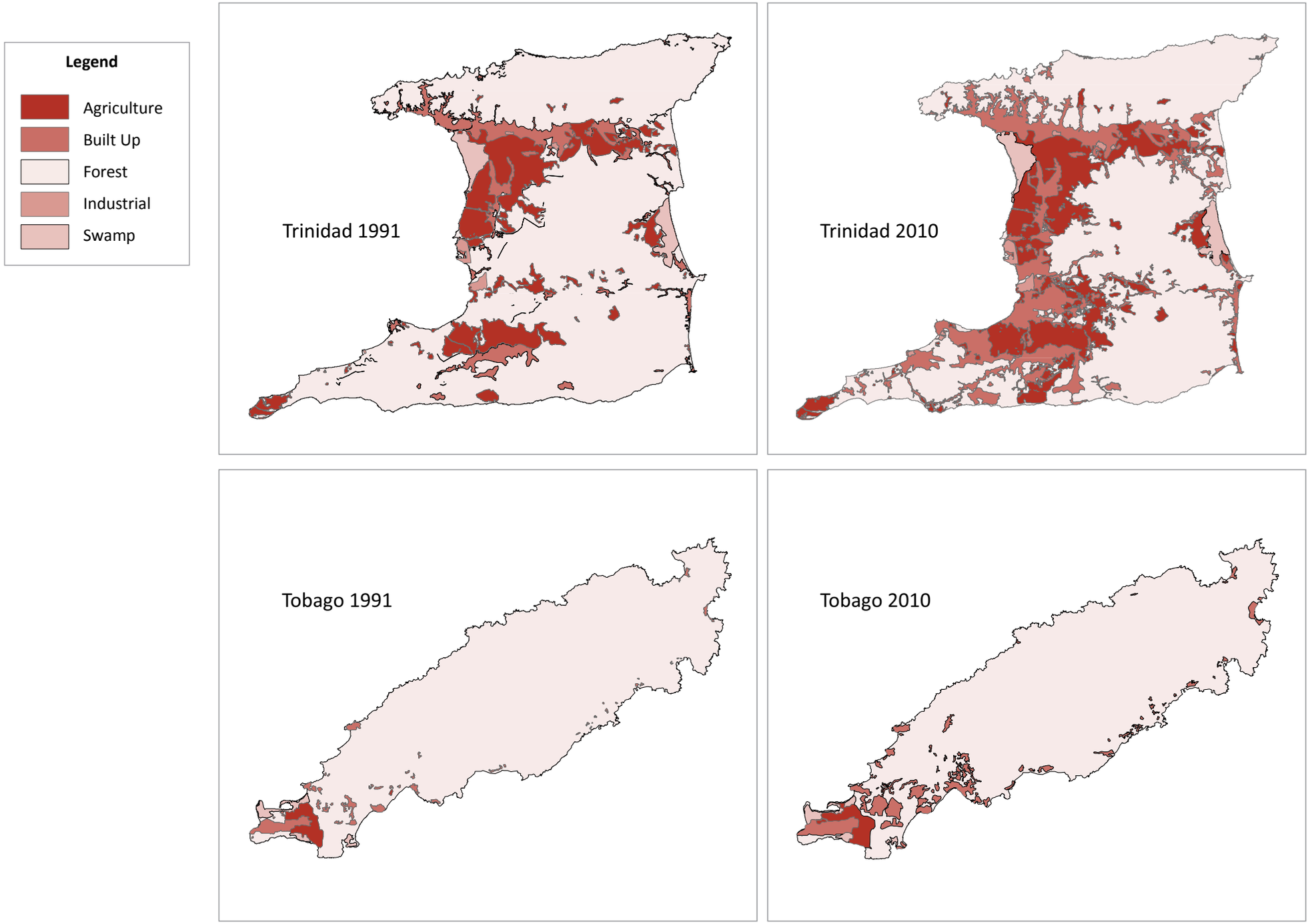


Figure 10: Land-use coverage 1991 and 2010

NSDS response to Ecosystem issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Achieving food security	Policy 3: Promoting sustainable urban and rural development
Using natural resources sustainably	Policy 12: Planning for agriculture and fisheries
	Policy 13: Sustainable use of natural resources
	Policy 14: Landscape management
	Policy 15: A coordinated approach to water resources and water quality
	Policy 16: Coastal and marine resource considerations

5.2 Climate and Air

It has been projected that the mean global annual temperature is to increase by 0.7°C to 2.6°C by the 2060s and by 1.1°C to 4.3°C by the 2090s[20]. A decrease in mean annual rainfall for Trinidad and Tobago is likely to be a direct consequence of the increase in global temperatures. Whilst there is some uncertainty surrounding the scale, scope and pace of climate change, it is clear that places and people will be exposed to significant climate change-driven impacts caused by increases in GHG emissions in the Earth's atmosphere. As a Small Island Developing State (SIDS), Trinidad and Tobago is particularly vulnerable to the adverse impacts of climate change.

[20] IPCC, 2007

The Working for Sustainable Development in Trinidad and Tobago report identifies the following as the likely impacts of climate change:

Agriculture Sector:

- Projected increases in air temperature are likely to increase the aridity of soils thus decreasing crop yields;
- Rise in sea level is likely to result in inundation of coastal areas and salination of soils; and
- Increased temperatures can result in the increased proliferation of new and existing pests and diseases and increase the demand for water for irrigation purposes.

Human Health:

- The projected increases in ambient air temperature are likely to increase the spread of vector-borne diseases since higher temperature and humidity favour the spread of these infections;
- Decreases in rainfall will affect the availability of potable water; and
- Projected increases in sea level and precipitation intensity are likely to result in increases in the incidence of water-borne diseases.

Human Settlements:

- Increased frequency and intensity of storms and the associated flooding and storm-surge effects can disrupt and destroy several coastal settlements, increasing the incidence of poverty.

Coastal Zones:

- Sea level rise will result in increased inundation, increased coastal erosion and loss of coastline, loss of natural resources such as wetlands and loss of important ecosystems goods and services; and
- Temperature increases will lead to loss of the country's vital coral reef ecosystems and fisheries resources.

Water Resources:

- As temperature increases, there will be loss of available surface water as increased evapotranspiration will take place; and
- Decreased precipitation will reduce percolation and recharge of groundwater reserves in aquifers. This will reduce the availability of surface water and underground potable water.

Flood Risk in Trinidad

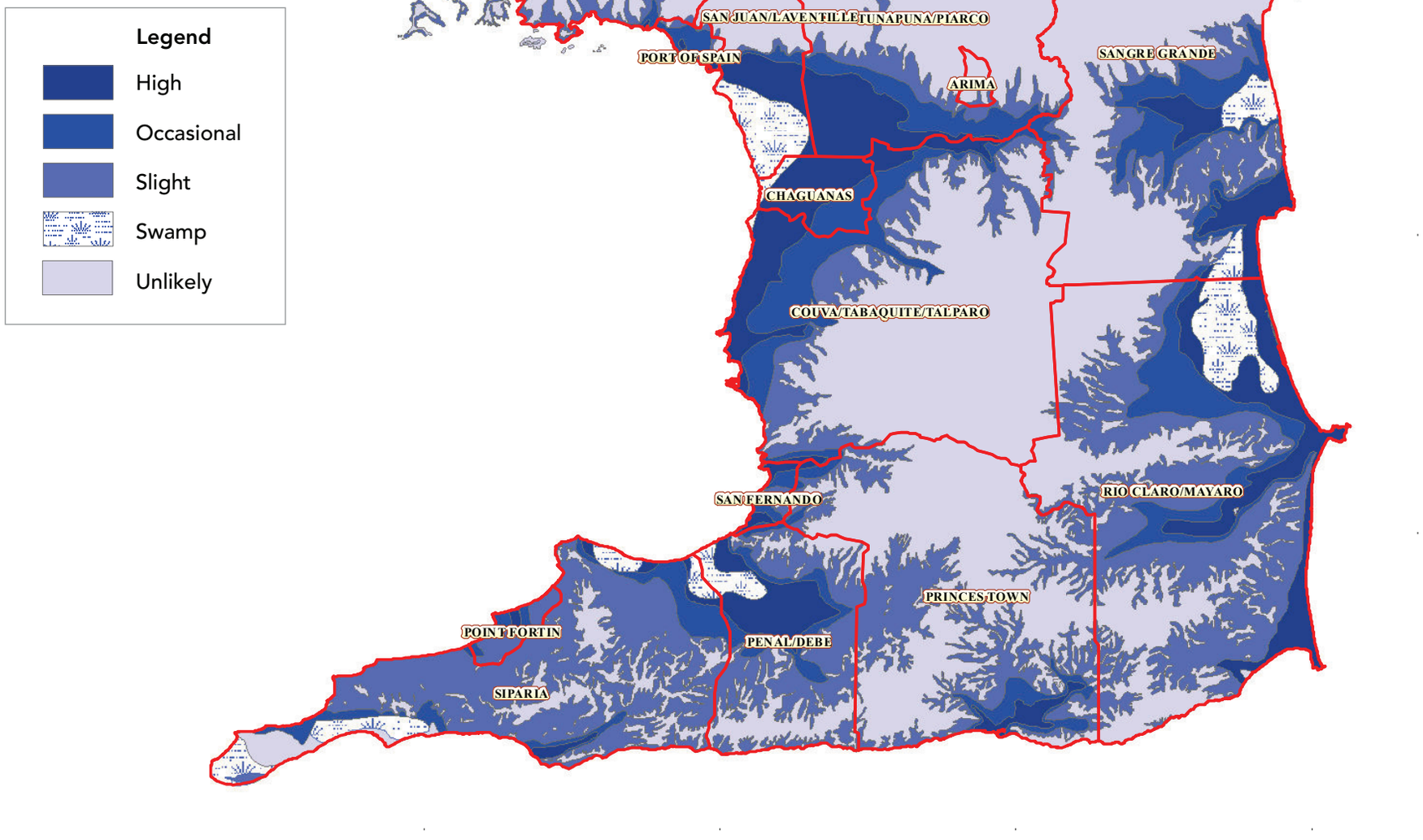


Figure 11: Flood Risk in Trinidad

The quantity of fossil fuels burned makes Trinidad and Tobago one of the major contributors to carbon emissions on a per capita basis. These activities, along with the incineration of solid waste material, also significantly reduce air quality and negatively impact on public health.

The EMA prepared Draft Air Pollution Rules in 2010 but, to date, they have not been finalised. Emissions of air pollutants into the environment are generally uncontrolled as enforcement is minimal. It has long been recognised that data pertaining to ambient air quality and air pollutant emissions is much needed to provide a sound scientific basis for policy and strategy development.

As a ratified signatory to both the United Nations' Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, through the National Climate Change Policy (2010) however, Trinidad and Tobago does affirm its commitment to pursuing development pathways that follow a low carbon approach. The mitigation and adaption recommendations set out in this policy are embedded in the NSDS in a way which encourages people to adapt the ways in which they live, build, travel, and communicate so as to maximise resilience to the effects and impacts of climate change whilst also reducing contributions to factors that are causing it.

NSDS response to Climate Change issues

OBJECTIVE

Using natural resources sustainably

Meeting the challenges of climate change

Moving towards sustainable transport

Generating and using energy sustainably

POLICY

Policy 17: Air quality

Policy 20: Managing hazard risk

Policy 21: Prioritising sustainable transport

Policy 23: Energy efficiency

6. INFRASTRUCTURE

6.1 Transport

Although extensive in coverage, the existing national road network offers low levels of connectivity in certain parts of the country because of poor road conditions, high traffic volumes in relation to road capacity, congestion and restricted capacity of arterial routes due to direct access and egress to roadside facilities. These conditions are contributing significantly to national levels of GHG emissions, which have increased by 278 per cent over the period 1990 to 2006[21].

The rising demand for travel since the rail system which was decommissioned in the mid-1960s, has been accommodated by relatively intensive development of the road network. This has coincided with a growth rate of vehicles which now outstrips population growth (Figure 12). Without any policy intervention the growth of private vehicles is forecast to continue – 600,000 by 2015 and 650,000 by 2020. The effects of this are likely to be compounded by the additional freight movement that will need to be accommodated on the road network following the growth of the two main ports (Port of Spain and Pt. Lisas) and further developments proposed for the South-West peninsula.

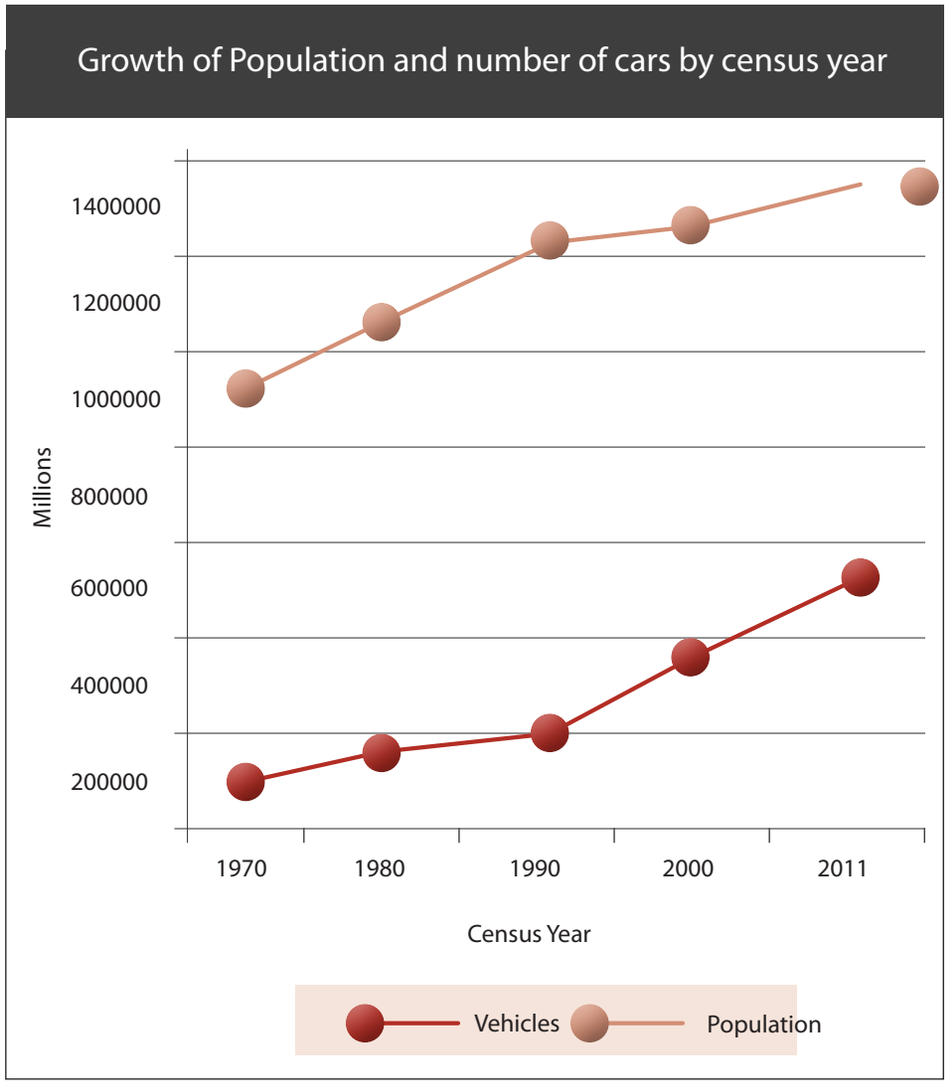


Figure 12: Population and vehicle number change

[21] Ministry of Planning and Sustainable Development, 2012

A congested transport network is contributing to disproportionate costs and difficulties for businesses. These issues are particularly prevalent in Trinidad where research has shown that the average peak hour journey times for relatively short urban journeys, in the main economic centres of Port of Spain, Chaguanas and San Fernando are commonly in excess of 90 minutes. Vehicle pollution in heavily congested areas also poses a significant health risk (particularly in relation to high levels of air-borne particulates) and is a major contributor to carbon emissions.

The issue of travel choice is complex and there are several interrelated factors that have contributed to the congested transport network in Trinidad (Table 2) and poor levels of public transport service across both islands. This is now impacting on quality of life and it risks stymying economic growth

Cause	Effect
Subsidised premium gasoline Heavily subsidised lower grades of fuel including diesel Relatively cheap imported used vehicles	Affordable car ownership and little financial incentive to use alternative modes
Lack of co-ordination of public transport	Limited confidence in timetabled services to connect with working hours
Lack of quality interchange facilities	No incentive to make a 'linked trip' i.e. utilising other modes (e.g. park and ride, walk, cycle)
Ribbon housing/business development concentrated on the main highway corridors	Outlying regions have no alternative to the car. Congestion is most acute at the economic centres
Fear of crime	The car is seen as a safe alternative to walking, cycling or using public transport
Climate	High levels of rainfall affect daily travel choice and impact on walking or cycling choice. In addition, poor waiting facilities aligned to wet weather impact on public transport patronage
Full employment (unemployment rate of 4.9%)	Large demand for travel during peak hours

Table 2: Issues contributing to traffic congestion

The air and sea links between Trinidad and Tobago do not cope adequately with peak travel demand. Expanded services and improvements to interchange facilities are required. ANR Robinson International Airport at Crown Point will require major improvements as the tourism sector grows; Scarborough Port and associated infrastructure improvements are physically constrained by the layout of the town. Ferry services depart from Port of Spain with relatively lengthy sailing times of 2½ hours and are susceptible to operational failures that result in delays. Similarly, the air bridge is plagued with issues of on-time scheduling and inadequate capacity during peak travel times.

Inevitably, new development will result in further demand for travel and transport within and between both islands and this must be managed in such a way that its adverse impacts are minimised and mitigated. The issues need to be addressed so that the adverse effects on communities, economy and the environment do not escalate; access to services can be maintained; and journey reliability improved. The solution requires coordination between the use and development of land and the provision of transport infrastructure so as to reduce traffic congestion and promote more efficient, less wasteful and less polluting modes and patterns of travel. It is therefore considered appropriate for a Sustainable Transport Strategy to be developed and implemented. Recommendations on a framework for such a strategy are provided in the Core Strategy and Regional Guidance document.

NSDS response to Transport issues

OBJECTIVE

Building strong, diverse regions

Building Places for People

Moving towards sustainable transport

POLICY

Policy 2: Sustainable regional development

Policy 3: Promoting sustainable urban and rural development

Policy 4: Designing and creating places for people

Policy 21: Prioritising sustainable transport

NSDS response to Waste Management issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Managing waste safely and efficiently	Policy 3: Promoting sustainable urban and rural development
	Policy 24: Waste management

6.2 Waste Management

An increase in the amount of waste produced has coincided with economic and population growth. However, the necessary expansion in waste management infrastructure has not followed and there is an expectation that the development of new industries, along with the rise of tourism, will continue to increase the production of household, commercial and industrial wastes in the country. The subsequent rise in new development to accommodate these changes will also increase the quantities of construction and demolition wastes.

Currently, all solid waste is transferred to landfill. There are five landfill sites in Trinidad and Tobago (see figure 13 below), none of which are lined to protect underlying groundwater or surface waters (for example, nearby rivers or streams) from contamination. Additionally there are numerous unauthorised dump sites in different parts of the country particularly along rural roads. Recently the EMA has raised concern with the Guanapo and Beetham Landfill sites in Trinidad and any new landfill site must be developed with an impermeable lining and other systems to prevent pollution or harm to human health and the environment.

The *Draft Integrated Solid Waste/Resource Management Policy* (ISWRMP), 2012, suggests that the domestic stream represents two thirds of the overall waste generated in Trinidad and evidence also confirms that well over 80% of residential waste is recyclable[22]. Recyclables (organics, paper and paperboard and plastics) represent over 70% of waste generated in Tobago[23]. Despite this potential, there is no nation-wide strategic approach to reuse, recycle or recover wastes.

Datasets relating to waste generation, treatment, and disposal allow for the future infrastructure requirements for waste management and the feasibility of possible solutions to be identified. However, this data is not currently available. Accurate and up-to-date data is crucial for supporting evidence-based planning decisions and future infrastructure implementation strategies. Indeed evidence-based management is one of the principles outlined in the *Draft* ISWRMP, which sets out the Government's approach to waste for the next ten years. The policy is intended to underpin a national integrated waste management system, which in itself, will identify the type and location of facilities that are needed.

[22] CBCL, 2010.
[23] EGARR & Associates, 2010.

Landfill Sites in Trinidad and Tobago

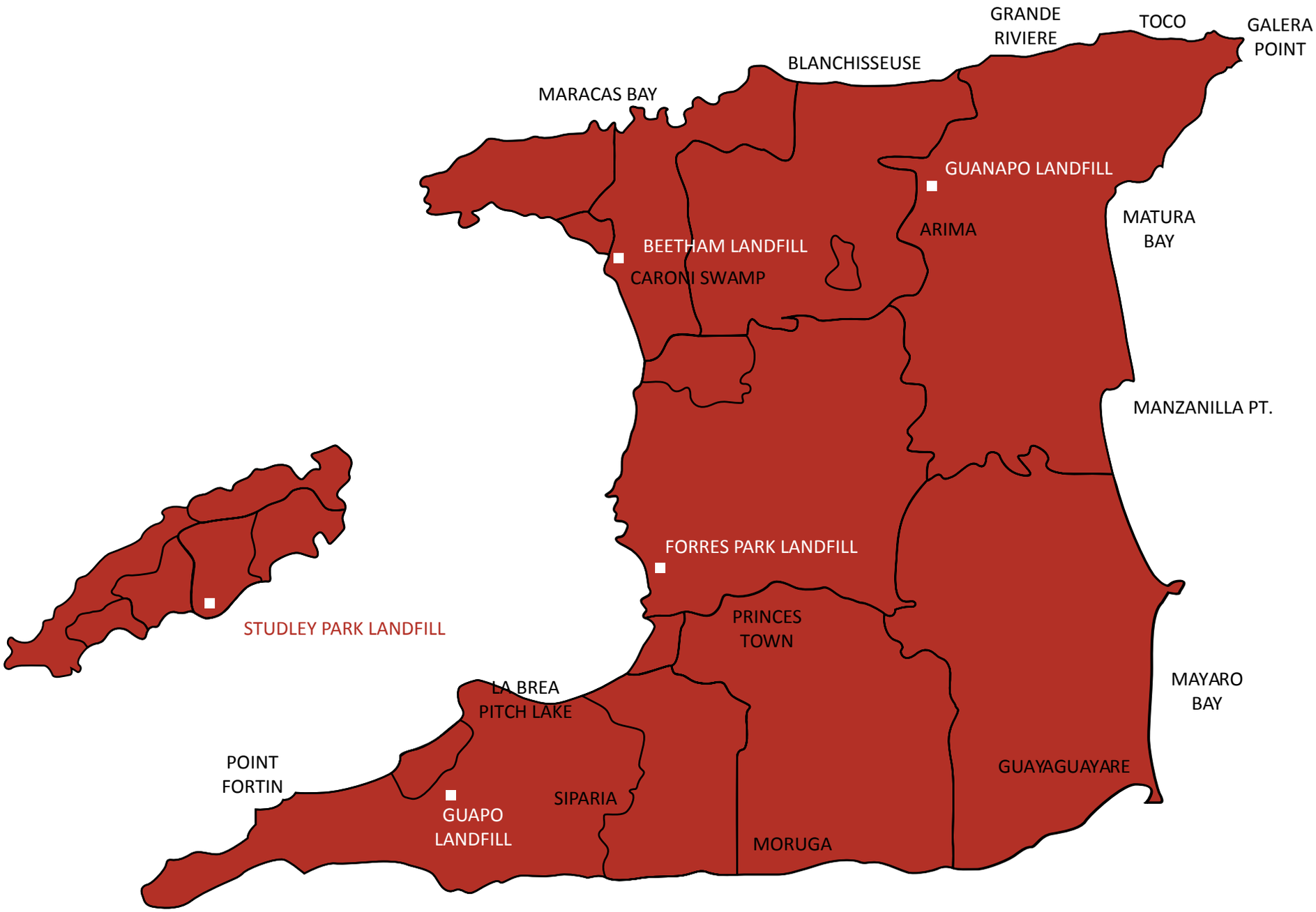


Figure 13: Landfill Sites in Trinidad and Tobago

6.3 Water and Wastewater Management

Central municipal wastewater collection and treatment was introduced in 1962. Since then, wastewater collection and treatment infrastructure has expanded to approximately 560km of pipeline and 243 wastewater facilities across both islands. However, it is estimated that only 30% of the population is currently serviced by wastewater systems. Septic tanks and pit latrines service the remainder of the population.

Improper sewage disposal is threatening the marine environment. The seepage of effluent into the sea and waterways stimulates algal growth, degrades offshore coral reefs and sea grasses and destroys fish nurseries through increased nutrient loading. Furthermore, faecal coliform counts that fall above the standard level of acceptability for bathing waters pose a risk to human life.

The issue of polluted coastal waters in Tobago, and the need to invest in central sewage facilities to provide safe disposal of sewage and wastewater, is well documented and efforts to improve the situation must be pursued

The discharge of effluents from industry, the improper disposal of domestic sewage and farm wastes, non-functional sewage treatment plants and the indiscriminate disposal of domestic refuse and solid waste are all contributing to the degradation of rivers and streams. This is especially troubling given that the majority of potable water emanates from surface sources and proper water quality is essential to quality of life.

Both quantity and quality of traditional fresh water resources have been rapidly depleted through overuse and pollution. In terms of water demand, the domestic sector is the largest single user of potable water in the country, accounting for approximately 36% of demand, followed by the industrial sector (18%), and then irrigated agriculture (3% of demand). Unaccounted-for-water comprises 40% of water demand.

Integrated Water Resources Management Policy (IWRMP) relates to drainage, drinking water supply, and wastewater processing. Trinidad and Tobago has an abundance of water during the rainy season, which, increasingly, results in occasional flooding in various areas. Conversely, in the dry season, water availability is tending to fall short, especially with the growth in demand for both urban and agricultural water use. In order to ensure adequate alignment with the IWRMP, the NSDS should endeavour to support development that contributes to optimising water resources in cases of both abundance and shortage. This includes the suggested maintenance under vegetative cover of important water recharge areas.

Water reuse can be encouraged and is most sensible to meet non-potable public water demands, particularly for irrigation of agricultural land and landscaping purposes and the primary means of attaining this is through advanced technologies in the wastewater treatment processes. Wastewater coming from municipal or industrial sources will affect its use in non-potable applications as well as indirect potable use in replenishing ground water aquifers.

NSDS response to Water and Wastewater Management issues

OBJECTIVE

Building strong, diverse regions

Using natural resources sustainably

POLICY

Policy 2: Sustainable regional development

Policy 3: Promoting sustainable urban and rural development

Policy 14: Landscape management

Policy 15: A coordinated approach to water resources and water quality

NSDS response to Flood Risk issues	
OBJECTIVE	**POLICY**
Using natural resources sustainably	Policy 14: Landscape management
Meeting the challenges of climate change	Policy 16: Coastal and marine resource considerations
	Policy 20: Managing hazard risk

6.4 Flood Risk Management

The pattern of settlement growth and development across the islands correlates strongly with the areas that are the most susceptible to flooding, such as the concentrated urban areas at the foothills of the Northern Range. Uncontrolled development and damaging land use practices (such as slash and burn techniques and land clearing for hillside construction) will continue to threaten more communities by increasing flood risk, erosion and run-off rates if action is not taken. In addition to decades of unplanned development, the flooding problem is also a result of the absence of maintenance and relevant upgrades to the drainage system. Other contributing factors are uncoordinated drainage works by several agencies, coastal development and reclamation, lack of rainfall and stream flow data, climate change and sea level rise and the absence of catchment analysis. Moreover, despite a wide range of legislation and policy guidance in place to protect lands and ecosystems from undesirable and incompatible development, thereby reducing the risk to many homes, businesses and related infrastructure, its application has been hampered by poor and uncoordinated enforcement mechanisms.

The Port of Spain Flood Alleviation Programme may soon provide tested methodology to aid in a national flood risk management plan. A hydrology and catchment analysis study has begun to inform future strategy.

There is no overarching policy objective that relates to the relevant legislative demands. The NSDS must strike the right balance between the need to protect existing and future development from exacerbating the risks, and securing the sustainable growth of main settlements in order to prevent further urban sprawl.

NSDS response to Energy issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Building Places for People	Policy 3: Promoting sustainable urban and rural development
Generating and using energy sustainably	Policy 4: Designing and creating places for people
	Policy 23: Energy efficiency

6.5 Energy

Oil and gas reserves have not only underpinned the economy but also supplied domestic energy needs at a relatively low cost. This low cost has been a significant disincentive to making more efficient use of energy resources and has led to Trinidad and Tobago becoming one of the most energy intensive economies in the world. This particularly worrying side effect of over-reliance on cheap energy is illustrated in Figure 14. This shows Trinidad and Tobago's efficiency in "converting" energy to productive wealth (GDP) compared with a number of other nations. In this case, efficiency is measured as energy used (measured in kilograms of oil equivalent) in producing each $US 1,000 GDP.

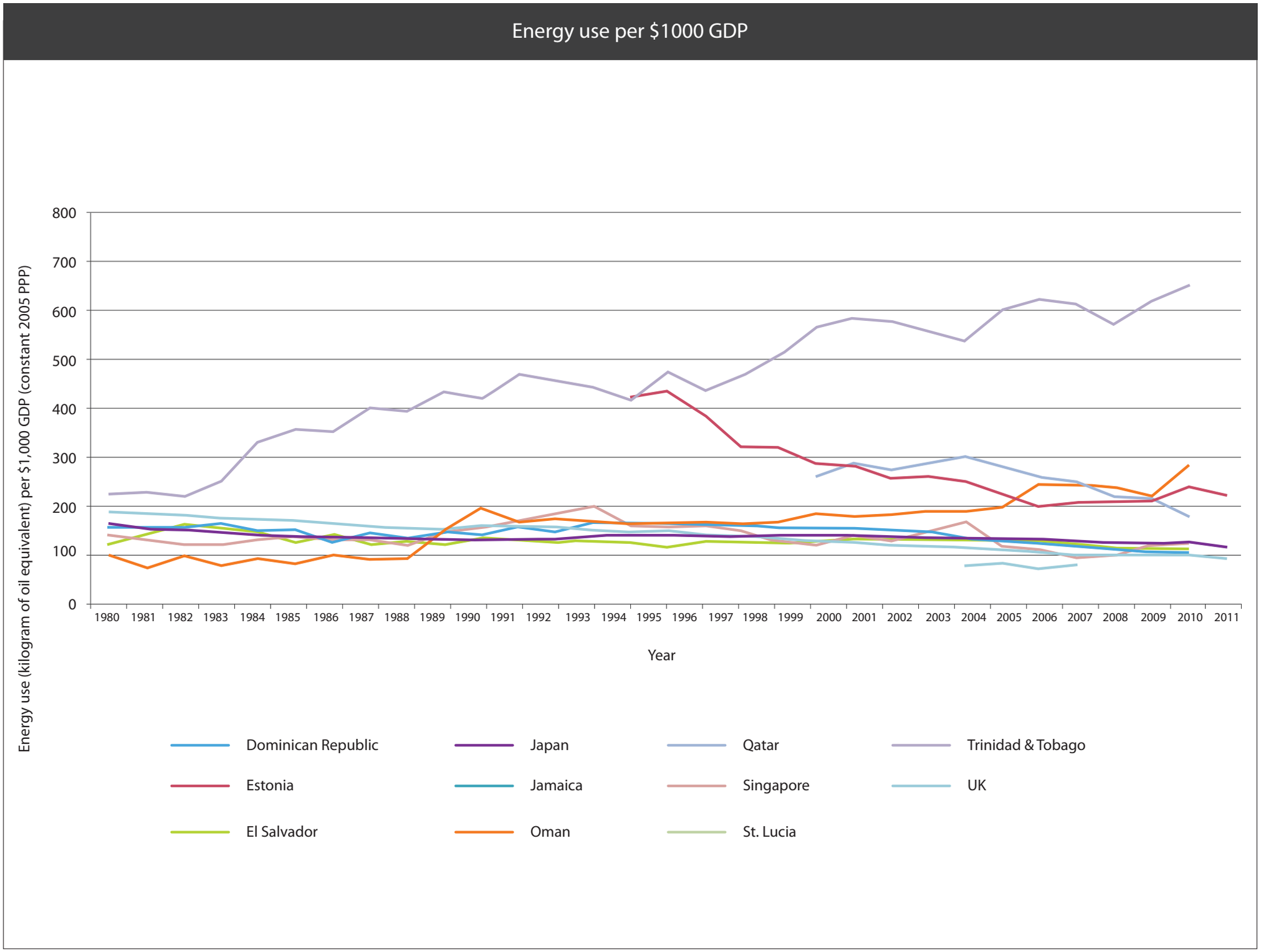


Figure 14: Energy Use Per $1000 GDP

Economic efficiency level is very low and this trend is going starkly against that of other oil-producing nations. Trinidad and Tobago appears to have been using fossil fuel energy less and less efficiently, whilst other nations have either been improving their efficiency or, at least, stabilising it.

There are compelling economic, national security and environmental reasons for moving away from the traditional reliance on non-renewable energy (Figure 15). The *National Climate Change Policy* (2010) signals the Government's commitment to achieving this:

"Trinidad and Tobago as a responsible member of the international community, is committed to pursuing a low carbon development path, consistent with the principles of sustainable development through the development and delivery of strategies and actions for maximising renewable energy resources, clean energy and clean production technology as well as adapting to the adverse impacts of climate change through integration within all aspects of national development in its infrastructural, human and socio-economic systems, at an acceptable balance of costs and benefits."

Electricity on both islands is predominantly generated from natural gas and, according to the MEEA, consumption has been increasing steadily since 1981. T&TEC recorded national electricity consumption in 2008 as being dominated by heavy industry (38%), followed by residential (28%) and then light industry (23%)[24].

Renewable energy is not currently contributing to the national grid, and the application of small-scale renewable energy infrastructure is limited to only a few solar-PV and wind installations. The *Renewable Energy Strategy* identifies the renewable energy technologies that have potential for development. In addition to solar, wind and biogas sources that are identified in the strategy, consideration should also be given to the potential linkage with waste management strategies. Biodegradable wastes can be fed into an anaerobic digestion plant whilst non-biodegradable wastes could form a fuel source for energy from waste plants.

The Inter-American Development Bank (IDB), in partnership with the MEEA, is providing a technical assistance grant which is to be used to support the development of a Sustainable Energy Matrix for the country; promote renewable energy and energy efficiency potential; and encourage the conservative use of fossil fuels. In addition, a wind resource assessment is to be undertaken to investigate which parts of Trinidad and Tobago have the greatest potential to harvest wind energy. These findings will be incredibly valuable and will need to feed into future policy and decision-making at the local level. In advance of the information being released, planning policy must provide a positive framework so that the findings and recommendations can be later implemented in the spatial context.

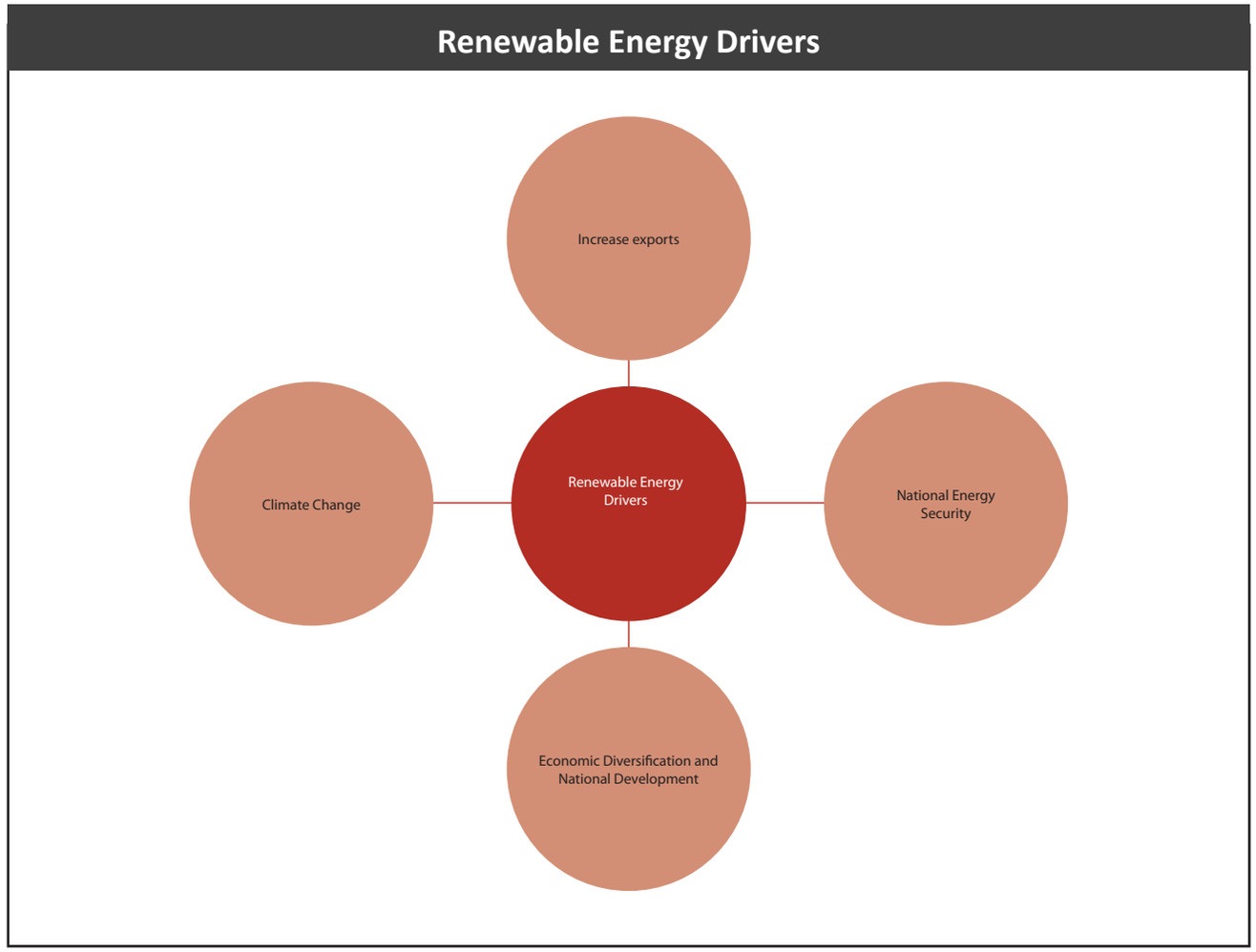


Figure 15: Renewable energy drivers

[24] Ministry of Energy and Energy Affairs, 2011. Framework for Development of a Renewable Energy Policy for Trinidad and Tobago.

6.6 Information Communication Technology (ICT)

ICT has the potential to play a pivotal role in the thrust for national development and economic diversification by creating an environment that stimulates entrepreneurial activity and creativity, widens the choice of economic activity, and increases the rate of economic growth, while at the same time improving social services and deepening social cohesion and interaction. ICT is therefore seen as a significant catalyst in the transformation to a secure, prosperous and sustainable nation. This is reflected in its inclusion as one of the seven pillars of development set out in the MTPF, in recognition that development and advancement in the global economy demands greater integration of ICT into the everyday activities of all citizens: "Information and Communication Technologies (ICTs) – Connecting Trinidad and Tobago and Building the New Economy". ICT also plays an integral part of Pillar 5: "A more diversified, knowledge intensive economy - building on the native genius of our people", while the remaining Pillars contain substantial ICT implications.

There has been significant progress made in terms of the broadening ICT accessibility over recent years. Internet household penetration for 2011 measured approximately 52.9% compared to 4.9% in 2007 and mobile phone subscriptions increased from 141,600 in 2000 to 1,826,200 in 2011[25]. Despite these achievements however, the nation continues to lag behind developed countries that dominate the upper levels of international benchmarking indices. The current *National ICT Plan for Trinidad and Tobago* (2012-2016) seeks to address this by building on the foundation established by the previous plan, *Fastforward*. Further improvements in ICT integration have potentially significant spatial implications. For example, it can greatly reduce the need for people to travel to work and to access a range of services, and this may, in turn, impact on the sort of development that is needed in particular locations and help to overcome issues of peripherality in rural areas.

NSDS response to ICT issues

OBJECTIVE	POLICY
Building strong, diverse regions	Policy 2: Sustainable regional development
Building Places for People	Policy 3: Promoting sustainable urban and rural development
Making the most of Information and Communications Technologies	Policy 4: Designing and creating places for people
	Policy 22: Priorities for ICT

[25] The Telecommunications Authority of Trinidad and Tobago, 2012. Annual Market Report.

REFERENCES

Annual Market Report: Telecommunications and Broadcasting Sectors The Telecommunications Authority of Trinidad and Tobago (2012).

All-Inclusive Project Development Services Limited, 2012. The National Physical Development Plan for Trinidad and Tobago, Phase 1: The Situational Analysis, Assessment Report.

Alkema L., Jones G., and Lai C., 2012. Levels of urbanization in the world's countries: alternative estimates Available at: http://paa2012.princeton.edu/papers/121285

Burke L., Greenhalgh S., Prager D., and Cooper E., 2008. Coastal Capital – Economic Valuation of Coral Reefs in Tobago and St. Lucia. World Resources Institute.

CBCL Limited, 2010. Trinidad Solid Waste Management Program Waste Characterisation and Centroid Study, Final Report. Ministry of Local Government

Central Statistical Office, 2002. 2000 Population & Housing Census: Community Register. Ministry of Planning and Development.
Central Statistical Office, 2009. Annual Statistical Digest. Ministry of Planning and the Economy.

Central Statistical Office, 2011.

Central Statistical Office, 2012. Human Development Atlas. Ministry of Planning and Sustainable Development.

Central Statistical Office, 2012. 2011 Population and Housing Census: Preliminary Count. Ministry of Planning and the Economy.

Central Statistical Office, 2012. Trinidad and Tobago 2011 Population and Housing Census Demographic Report. Ministry of Planning and Sustainable Development.

EGARR & Associates, 2010. Solid Waste Characterisation Study for Tobago, Draft Final Report.

Government of Trinidad and Tobago, 2010. National Tourism Policy of Trinidad and Tobago.

Government of Trinidad and Tobago, 2011. Medium Term Policy Framework 2011-2014. Ministry of Planning and the Economy.

Government of Trinidad and Tobago, 2011. National Climate Change Policy.

Government of Trinidad and Tobago, 2011. National Protected Areas Policy.

Government of Trinidad and Tobago, 2012. Working for Sustainable Development in Trinidad and Tobago. Ministry of Planning and the Economy.